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BLUE JAY

December 1997

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EDITOR'S MESSAGE

The correct scientific name for the buffalo berry in the last issue of *Blue Jay* (p. 169) is *Shepherdia argentea*, whose full common name is Thorny Buffalo Berry. The species mentioned in the article is the Canada Buffalo Berry and the plant use information could apply to it as well as to the Thorny Buffalo Berry, although the article was clearly referring to *S. argentea*. However, to harvest Thorny Buffalo Berry, you do not have to pick the fruit. Wait till the first frost, then spread a sheet or tarpaulin on the ground, and tap the bush with a heavy stick. There are most of the berries ready for use.

I would like to request contributions of back issues of *Blue Jay* for the archives. We have complete sets of the *Blue Jay* from 1951-1997. The copies needed to fill the gaps are for the following years:

1943-no archival copies
1944-no archival copies
1945-need volumes #1, 3, 4
1946-need volume #1
1948-need volumes #1, 3, 4
1949-need volume #3
1950-need volume #4

If you have these early issues of *Blue Jay* and would like to donate them to the archives please contact the Editor.

The last issue carried a photograph of an Athabascan Thrift incorrectly attributed to Diana Robson. The photograph of this endangered species of plant was taken by Peter Yonkers - sorry Peter. Also, for the record, the cover photo of Western Red Lily on Volume 54, No. 4 was one of mine not Anna Leighton's.

Our first two authors in this issue, Andrew and Ben Settler, are 15 and 17 years old respectively. The editors applaud these new authors for their contribution and would encourage more of our younger members to put pen to paper.

I want to thank Gail Bunt for the wonderful job she has done on the annual index. After much research and thought Gail has produced an index that fits both *Blue Jay*'s style and current professional philosophy.

Sincerely,

Roy D. John

TWITTER, A TAME BALTIMORE ORIOLE

Andrew and Ben Settler, Box 129, Lucky Lake, SK S0l 1Z0

If you ever drop in to our farmhouse, 3 miles northwest of Lucky Lake, Saskatchewan, you'll see a little bird in a cage at the end of the hall. You may ask, "Where did you buy that?" Many people are surprised when we tell them that it is a wild bird rescued after its nest had been disturbed by cats. The cats killed one young bird, but we managed to save two and bring them into the house. Mom cautioned us that wild birds have little chance of surviving in captivity, but she agreed to help us. We tried feeding them insects and provided a dish of water, but one died overnight. Next day we started feeding the remaining bird little pieces of hamburger on a toothpick. That was the solution. It would stretch up when we held a piece over its head, then swallow it whole. Eventually, when the bird started eating by itself, we moved it into a cage.

Andrew Settler, with Twitter

Ben Settler

"Twitter" is now a brilliant male, three years old, black-backed with and orange breast. He eats celery and ordinary soft-billed bird food (we weaned him off hamburger after about two months). He moults every spring but the feathers grow back after about three weeks. Because he was put in a cage, he didn't learn to fly, although he can flutter about a foot and a half off the floor. He loves to leave his cage to roam around and will perch on our fingers without hesitation. He shows no fear whatsoever and will peck your finger hard enough to draw blood if you bother him too much.

Twitter loves to hear water running and chirps merrily whenever clothes are being washed. We have taught him a few songs, including a wolf-whistle and Woody Woodpecker's song, the one he sings most. Sometimes he sings along when we're playing a CD; he seems to prefer classical over heavy metal, but he isn't too fussy. He is fond of bathing, his bird bath being a plastic cube with an opening into the cage. He will splash and shake for as long as five minutes at a time.

It's been great having the little guy around, and we can only hope he'll be with us for a long time yet.

A JUNE BIRD DRIVE

VICTOR C. FRIESEN, P.O. Box 65, Rosthern, SK S0K 3R0

My wife Dorothy and I enjoy bird "drives" as much as bird walks. The countryside east of our home in Rosthern has a rich variety of habitat for all kinds of birdlife (and splendid prospects for landscape photography). So we mosey along, stopping often to look and listen (and photograph). "What is so rare as a day in June?" poet James Russell Lowell has asked, and the late afternoon and evening of 3 June 1997 is indeed a special day in our travels. Here are some of our observations.

Our journey begins along Highway 312 and takes us first to Gabriel Bridge, where a trail leads down to the old ferry crossing. There, a Spotted Towhee, still common along river ravines in the northern part of its breeding range, hops in the dust. It darts among the nearby willows, and we hear its mewing call, a repetition of its name. After a while its not unmusical song greets us repeatedly: *chup*, *chup*, *chup*, *chup*, *zee-ee-ee-ee*. We are glad that we stopped, for in the background a White-throated Sparrow whistles its "five pure notes succeeding pensively," as another poet, Archibald Lampman, has said. It is just in the last few years that I have heard this sparrow's song this late in the season at Rosthern.

American White Pelicans *George Tosh*

As we drive over the bridge, we notice the absence of Cliff Swallows, which once swooped and fluttered (and chattered) about the steel arches in dozens, if not hundreds, for they nested under the roadway. In 1995, the bridge was sandblasted and repainted, but I suspect that in a year or two the swallows will be back. (Once a *robin*'s-egg blue, the bridge is now a *teal* green.) Of note are the American White Pelicans, one flying beneath the bridge as we cross, three more on the shoreline, and yet another sunning itself on a rock in midstream.

Two-thirds of the way to Wakaw, our turn-around point 25 miles distant, we drive among a series of alkali flats, now water-covered and ringed with crusty shorelines (on one occasion I was able to photograph striking concentric circles of blue water, white shore, red samphire, and bordering tawny grass). Past these flats and slipping through a valley in the Minichinas Hills, we spy a Great Blue Heron flapping along, neck a-crook, and, as Henry David Thoreau has written, "carry[ing] its precious legs away to deposit them in a place of safety." We may mee the bird again.

Nearing another alkaline water — more of a slough this time (the salty smell is invigorating) — I spot what I think is a Western Meadowlark on a nearby fence post, but on driving by, I identify the bird as a Common Snipe. I back up slowly for a better view. The bird stolidly maintains its position, the jagged lines of black and buff feather tips on its upper body showing to advantage in the bright sunlight. I am familiar with this species from earlier in spring when it zigzags above the town's reservoir, making its winnowing courtship flight/sound.

The journey resumes, with a vee of birds overhead — pelicans again, 23 of them in perfect alignment. I glimpse them just as they begin to glide (after an interval of wingbeats), and not one individual moves a feather. Theirs is a unisoned flight, a huge arrow drifting cloudlike through the sky. I seem lost in time for a few seconds, watching them until, in unison again, their wings start a slow flapping.

Now we are homeward bound, the sun dipping to the horizon, the light soft: a good time for photographs. We are moseying along a different route — municipal roads and trails two miles north of the highway. The Minichinas Hills are all about us, and our journey seems to be as much up and down as westward. There are little ponds among the hills, looking like Scottish Highland tarns. On one of them, Franklin Gulls swim in a tight flock; others fly above the hill-shaded water. This will be their refuge for the night after spending the day afield — on some farmer's field, following the tractor, pitching down for beetles and grubs in the overturned soil.

Presently, we are skirting another of the chain of alkali flats encountered before. On a tufted island of grass near shore, a Great Blue Heron stands in silent, classic pose, unmoving, as in a Japanese silk-screen. Is it the same heron we had seen before? Possibly, but while I am getting my camera ready, it departs, once more trailing its precious legs elsewhere.

Next in view is a Great Horned Owl veering off the road ahead of us and sailing low over a grassy meadow. Since our eyes are riveted on it, we do not at first see two young owls directly in front of us, each skittering along opposite sides of the trail. They are near adult size but still whitish — like two scraggy balls making a getaway. I have never seen owls run before, and the sight of these two "ookpiks" ahead of us causes my wife and me to burst out laughing.

I immediately stop the car, and at the same time the young owls take off, for they can fly well. Fly, yes, but land with some difficulty. One bobbles onto a perch at the top of a roadside aspen and glares at us. The second tries for a lower limb, overshooting its mark, yet catching the claws of one foot on the branch. The result: a somersault about the limb, then dangling from it by one leg, head downwards, wings outstretched. It takes a quarter minute before the owl disengages itself and plops to the ground, where it stands erect to observe us. With this spectacle over, we notice a fourth owl, an adult, sitting on a tree stub, ear tufts uplifted slightly. It has been watching the young, and us, the whole time.

The sun has almost set. A warm glow covers the hills and fields, those not already in deep shadow. As we pass a small pothole of water

Young Great Horned Owl *Roy John*

in a field, a heron, most likely the one we disturbed before, heavily takes wing, uttering a hoarse squawk. We will see it no more.

Then at a sharp bend in the road, my eyes are attracted to more "herons" behind us, but a second glance affirms them to be Sandhill Cranes. Cranes in June in the Rosthern area are an uncommon sight, likely a late-migrating flock. There are ten of them standing more or less in a row, turned this way and that. I have been driving very slowly up to now, and just as slowly I turn the car to get a better view; the birds are bathed in a ruddy light, the grasses behind them more gold than green. Then the cranes begin to dance — we hold our breath — and the stately creatures step gingerly about and lift up their wings. We are only 50 yards distant.

Some time later we are travelling westward again in the gathering darkness. Two miles from Rosthern, another (silhouetted) Great Horned Owl hoots from the cross-arm of a power pole, bending forward in a crowing-rooster fashion. It has been a memorable bird drive.

Bird Names

Costa, Louis Marie Panteleon (1806-1864) Marquis de Beau-Regard and collector of hummingbird specimens - Costa's Hummingbird.
Craveri, Frederico (1815-1890) Italian scientist, chemistry teacher and ardent collector - Craveri' Murrelet.

DENSITIES OF LOGGERHEAD SHRIKE ON STUDY BLOCKS IN SOUTHEASTERN ALBERTA INVENTORIED IN BOTH 1993 AND 1996

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Many of the world's 30 species of shrikes (*Laniidae*) are considered to be declining.[9] Loggerhead Shrike (*Lanius ludovicianus*) populations are of concern throughout much of their range. In eastern Canada, the Loggerhead Shrike is classified as endangered and the population west of Winnipeg as threatened.[4] Populations declined significantly from the 1950s to the 1980s,[2,5,7] but Price and Droege (1995) have suggested that Loggerhead Shrike numbers have been more stable over the past decade. Because population trends can vary substantially from one region to another, it is important to monitor Loggerhead Shrike populations at the regional level.

In 1993, the Alberta population of Loggerhead Shrike in southeastern Alberta was estimated[1] by thorough checks of randomly selected study blocks within 23,600 km^2 of core shrike habitat[8] in the northern portion of the mixed grass ecoregion. During 1996, H. Kiliaan reinventoried 12 of the 26 study blocks that were first censused in 1993. We report the results of the 1993 and 1996 censuses.

Methods

Field techniques in 1996 were similar to those used in 1993.[1] Briefly, 6.4 km x 6.4 km study blocks were intensively searched between 15 June and 7 July. All areas supporting woody vegetation were surveyed using a combination of truck, all-terrain vehicle and foot travel. Study blocks were selected randomly for the 1993 census. Study blocks inventoried in 1996 were representative of the range of shrike densities recorded in the 1993 inventory. Independent observations of shrikes within 400 m of one another were considered to be either the same pair (2 birds observed) or the same individual, unless additional observations or information (behavioural interactions or the presence of a second nest) indicated otherwise. Because repeat visits to nine territories (six in 1992 and three in 1993) where single birds had been observed originally, revealed two adults with eggs or young in all cases, each single shrike more than 400 m from any other was regarded as an indicated pair. Also, Collister (pers. comm.) concluded that there were very few unpaired adults on his intensive study area[3] in southeastern Alberta. The current study area was located in the northern portion of the mixed-grass ecoregion of Alberta and has been described previously.[1]

Table 1. COMPARISON OF NUMBERS OF LOGGERHEAD SHRIKES OBSERVED ON 12 STUDY BLOCKS INVENTORIED IN BOTH 1993 AND 1996

Block	1993		1996		Change	
	Shrikes Observed	Indicated Pairs*	Shrikes Observed	Indicated Pairs	Shrikes Observed	Indicated Pairs
74	13	8	14	8	+1	0
75	14	7	14	11	0	+4
77	10	8	16	11	+6	+3
79	6	4	9	5	+3	+1
81	16	11	8	5	-8	-6
82	13	10	8	5	-5	-5
86	0	0	4	2	+4	+2
91	0	0	0	0	0	0
94	0	0	8	5	+8	+5
104	0	0	0	0	0	0
105	0	0	2	1	+2	+1
114	18	13	13	12	-5	-1
All	90	61	96	65	+6	+4

* Indicated pair is an observation of a single shrike or two shrikes within 400 m of each other unless simultaneous observations (or the presence of a second nest) indicate they were not members of the same pair.

Results

Ninety-six shrikes and 65 indicated pairs were observed on the 12 study blocks censused in 1996 (Table 1). In 1993, ninety shrikes and 61 indicated pairs were observed on these same study plots. The mean number of indicated pairs per study plot in 1996 (5.41 ± 1.24) was not significantly different from the corresponding mean (5.08 ± 1.44) from the 1993 census. In 1996, the ratio of observed pairs to indicated pairs was 27:65, quite similar to the corresponding ratio from the 1993 census (24:61).

Indicated pair numbers were quite stable for 7 of the 12 study blocks. Indicated pair numbers changed by 2 or less for these blocks. Two study blocks supported substantially fewer (-5 and -6) indicated pairs in 1996, and three study blocks supported substantially more (+3, +4 and +5) indicated pairs in 1996 than in 1993.

Discussion

Our results concur with the suggestion that shrike numbers have been relatively stable in western Canada over the past four or five years.[6] There was little change in numbers of shrikes or indicated pairs in our study. The slight increases observed are difficult to interpret. We intentionally selected study plots that represented the range of shrike numbers encountered during the 1993 census, including five study plots that supported no shrikes during that census. As it was impossible for shrike (or indicated pair) numbers to decline on these five study plots, our comparison may be biased toward showing an increase. If these five study plots are eliminated from the comparison the total numbers of shrikes and indicated pairs decreased by eight birds and four pairs. This comparison is however, biased toward a decrease in the same way that the 12 study blocks comparison is biased toward an increase.

While variation in numbers of shrikes on individual study blocks was considerable, perhaps due to small sample size, there were no physical changes (land use, habitat, etc.) that seemed to coincide with or explain this variation. Potential reasons could include variable effects of weather, predation, prey populations, land management, and factors related to migration and overwintering. Temporary conditions prevalent weeks before census work began may have influenced territory selection.

Because decreasing populations of shrikes are a world-wide phenomenon we suggest that trends on these study blocks be monitored in future.

Acknowledgements

We thank J. Allen, D. Collister, K. Froggatt, E. Hofman, L. Lester, G. Nieman, I. Pocock and J. Potter, for capable field assistance. D. Collister provided helpful input concerning various aspects of the original study protocol. A. Murphy and two anonymous reviewers provided critical review of earlier drafts. Landowners are thanked for allowing access to their land.

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Bird Names

Franklin, Sir John (1786-1847) British sailor, navigator and Arctic explorer, who died on his fourth Arctic expedition - Franklin's Gull.

Gambel, William (1819-1849) Young naturalist who died of typhoid while exploring and collecting birds - Gambel's Quail.

Harlan, Richard (1796-843) Physician, naturalist, author and friend of Audubon - Harlan's Hawk.

Harris, Edward (1799-1863) A friend, supporter and travelling companion of Audubon - Harris' Hawk and Sparrow.

NORTHERN PARULAS WEST OF LAKE WINNIPEG

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The Northern Parula (*Parula americana*) is an attractive warbler that reaches the northwestern limit of its known breeding range in extreme southeastern Manitoba.[3] Its best-known strongholds in the province are in or near Whiteshell and Nopiming Provincial Parks, within about 50 km of the Ontario border. The possibility that its range extends west of Lake Winnipeg was rumoured in the 1960s, and stimulated at least one field trip to Beaver Creek and Calder's Dock on the western shore of that lake, 15 June 1969.[3] The almost annual occurrence of this species as a migrant (admittedly a rare one) in Winnipeg in recent years also suggests that such a westerly population may exist.

This note documents recent observations of Northern Parulas at Beaver Creek (approx. 51° 20' N, 97° 00' W), finally confirming the 30-year-old rumours! Additional records for Hecla Island and Grindstone Provincial Recreational Area (PRA), a little farther south, demonstrate that a significant population of Parulas exists in this part of the province. These locations are shown, along with the previously published breeding range of the Northern Parula, in Figure 1.

The Beaver Creek discovery was made by Bradshaw, who spent much of the summer of 1989 at Hodgson, Manitoba.[1] He was unaware of the suspected presence of Northern Parulas in the area, when he found three singing males, seeing one of them well, at Beaver Creek on 2 July 1989. Taylor visited the area at 7 a.m. on 18 June 1991 and also found three singing males along a 2 km stretch of Provincial Road 234 at Beaver Creek. The habitat was similar to that in breeding localities east of Lake Winnipeg, although somewhat less densely wooded.[3] The Parulas were found in mature spruce and mixed-wood stands, and the vital nesting material, *Usnea* lichen, was present in quantity. Taylor returned to the same locality at 6 a.m. on 1 July 1993; despite rain and strong winds, one Parula was singing at the same spot as one of the 1991 birds, near a transmitter tower. A further visit under better conditions on 27 June 1997 turned up two singing Parulas.

Shettler has observed Northern Parulas in Grindstone PRA each year since 1982. Parulas have been seen at many points along the road running from Highway 8 to the cottage development at Little Grindstone Point. The area around Little Grindstone Beach is very reliable for this species, with as many as four singing males observed on three different dates: 16 May 1987, 23 May 1989 and 3 June 1992. Males typically arrive on territory in mid-May, the earliest observation being on 14 May 1989. The latest sighting was on 22 August 1987. The Parulas observed in the Grindstone area tend to favour mixed-wood stands of trees

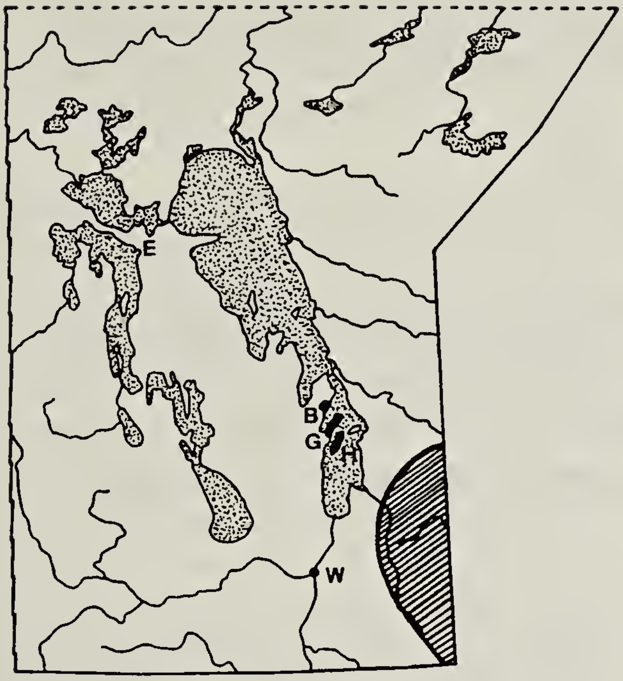

Figure 1. Southern Manitoba, showing the previously published range of the Northern Parula (shaded area, based on ref. 3). Labelled localities are: B = Beaver Creek; E = Easterville region; G = Grindstone PRA; H = Hecla Island; W = Winnipeg.

that are dominated by mature Balsam Fir and White Birch.

Bradshaw also found Northern Parulas on Hecla Island during his 1989 and 1991 visits to Manitoba: two each on 20 August 1989 and 16 August 1991, and one each on 6 and 19 August 1989 and 29 August 1991.[1,2] These may have been either migrants or local breeders. Shettler has noted singing males on three occasions on a Breeding Bird Survey route on Hecla Island: one on 9 June 1989, two on 10 June 1994 and one on 16 June 1995. A little farther south, R.F. Koes and R.W. Knapton heard a singing male Northern Parula, evidently a migrant, in deciduous woods near Gimli on 15 May 1977.

These records demonstrate that the Northern Parula has established a small population on the western shore of Lake Winnipeg. This is a significant extension of the species' published range in Manitoba; it confirms earlier suspicions of such a population, rather than being a recent range expansion. Much of the region is inaccessible, so the extent of this population is hard to estimate; it is unlikely to be limited to the three localities described here. Taylor did not find this species during Breeding Bird Surveys in the Easterville area, about 300 km farther northwest, in 1991, 1993 and 1994, although there appeared to be appropriate habitat.

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IS HABITAT FRAGMENTATION A FACTOR IN THE DECLINE OF THE BURROWING OWL IN SASKATCHEWAN?

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Introduction

Worldwide, habitat destruction is considered one of the leading causes of wildlife extinctions. However, wildlife populations may decline not only when habitat is directly eliminated, but also when habitat is degraded to varying degrees. Habitat fragmentation is the transformation of large continuous blocks of habitat into much smaller, isolated patches. This process has been recognized as one of the most important issues in modern conservation biology because the impact on wildlife populations is greater than what is simply predicted on the basis of the area of the habitat removed.[17]

The Great Plains of North America is one of the most heavily modified and fragmented ecosystems in the world mostly due to agriculture.[16] These grasslands have variable or high plant species diversity because of differences in climatic conditions, and the frequency and intensity of disturbances such as fire. Modern agricultural practices, the elimination of most grasslands, removal of native grazers, fire suppression, the expansion of woody vegetation and recent increases in some predators and cowbirds are often cited as possible causes of declines.[5,7,14,19] Reproductive potential, dispersal ability, food supply, habitat selection, rarity and vulnerability to human actions of species interact with the size, shape and arrangement of habitat fragments, surrounding matrix and habitat changes over time. These interactions determine the likelihood of survival of small isolated populations and ultimately, the species composition of communities. Habitat related issues are thought to be primary causes of declines of Short-eared Owls, Piping Plovers, Long-billed Curlews, Ferruginous Hawks, Swift Foxes, Baird's Sparrows and Loggerhead Shrikes on the Canadian Prairies.[10]

The Burrowing Owl *(Athene cunicularia)* is a prairie species that has been in precipitous decline in Canada over the last decade (from 2500 pairs to about 1000 pairs).[8] As a result, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has classified the Burrowing Owl as an endangered species.[21] It has been estimated that the present extent of Burrowing Owl breeding habitat is only 27 percent of the present total of cultivated and pastureland in Saskatchewan.[21] It should be noted that this estimate includes land that is not suitable for Burrowing Owls. As a result, conversion of Burrowing Owl habitat has occurred more quickly (up to 3 percent per year from 1979 to 1986) than the rate of reduction in pastureland suggests (0.8 percent per year between 1966 and 1991).[9,21]

Methods. The Burrowing Owl was used to illustrate the situation on the Canadian prairies and as a "focal species" for prairie conservation. The relationship between landscape fragmentation patterns and the spatial and temporal distribution and population turnover of Saskatchewan Burrowing Owls was investigated on 125,664 ha circular plots.[20] Data were collected from 152 Operation Burrowing Owl (OBO) plots and 250 random plots located on 1990 LANDSAT-TM satellite images and 1:250,000 scale topographic maps. The number of Burrowing Owl pairs were recorded in each OBO plot. Habitat continuity, patch dimensions and isolation of sites were measured and analyzed with univariate and multivariate statistical methods.[20]

Results and Discussion

Spatial Distribution. The spatial arrangement of grassland patches was significantly different between the core and peripheral areas of the Burrowing Owl range.[20] The core (Moose Jaw-Regina south to U.S. Border) had at least 1.5 OBO sites per 1000 km^2 and the periphery (rest of the Saskatchewan Burrowing Owl range) had less than 1.5 OBO sites per 1000 km^2. Core owl sites had smaller patch dimensions and lower habitat continuity, but had greater owl site persistence probably due to immigration from a larger number of nearby owl sites than did peripheral owl sites.

Burrowing Owls did not nest randomly across the landscape in Saskatchewan.[20] It appeared that owls preferred more fragmented but less isolated habitat in the core area. This preference may be due to factors such as burrow and prey availability. Abundance of Burrowing Owls is probably the greatest with lacustrine (old lake beds) soils, because of higher burrow availability.[21] The lacustrine soil type was more limited (22.7 percent of landscape) in the core than in the periphery (33.3 percent of landscape) and this may have influenced the selection of more fragmented habitat in the core range.[20] The quality of habitat patches in terms of vegetation structure, presence of fire and introduced plant species may also affect the distribution and population size of grassland birds, mammals and plants.[5,6]

Burrowing Owls do nest in small habitat patches and forage over other cover types.[3, 5] This is in contrast to grassland species that increase in numbers with patch size due to reduced nest predation and fewer cowbirds.[5] In fragmented landscapes, Burrowing Owls may forage greater distances within larger home ranges and spend more time away from the nest, making them more vulnerable to predators; and therefore, less efficient at reproduction.[3]

Some of the highly fragmented sites used by Burrowing Owls had large numbers of pairs (15 or more) from 1987 to 1993.[20] Higher raptor densities in small habitat fragments has been reported previously by James.[11] Crowding into small patches can increase intraspecific competition that is manifested as foraging interference, aggression and cannibalism. Intraspecific competition is thought to be a major cause of nest abandonment and low productivity of dense Burrowing Owl colonies.[2] High densities of nests may attract predators while lower densities would force predators to concentrate on other prey.[10] Chance events such as flooding and predation are also likely to increase the probability of nest site abandonment by Burrowing Owls. These events may explain the population decline of the Burrowing Owl in Saskatchewan.[20]

In highly fragmented areas, such as the core of the range, edge becomes important. Several studies have shown that artificial nests and natural nests can suffer greater predation rates when placed near edges.[1,13] Owls nesting near edges would suffer greater predation from predators such as foxes that search more thoroughly along pasture edges near cover.[21] For example, nest predation by badgers is a major cause of nest failure and abandonment in Burrowing Owls in Oregon.[2] The Burrowing Owl may be more adversely affected by edge effects because of nesting in underground burrows and selection of pasture edges with good visibility at the start of the breeding season.[21]

Isolation might be less important in the core because the fragments although smaller were closer together and owl site density was greater than in the periphery.[20] Nesting near other owls in the periphery may be important for successful dispersal and pairing success. In addition, isolation increases exposure to predators, increases delays in finding another owl colony, nest burrow, or mate, and lowers the feeding efficiency and thus decreases the probability of dispersal between owl sites.

Persistence. Continuity of habitat can be important to the persistence (or the presence) of grassland wildlife such as Burrowing Owls, clonal plants and small mammals over time.[20] The positive correlation between persistence and habitat continuity is often attributed to larger subpopulations, reduced predation and fewer cowbirds, increased pairing and nesting success, lower rates of interspecific competition due to less crowding and increased probability of successful dispersal of individuals in the landscape.[20]

The negative correlation between Burrowing Owl persistence and amount of patch edge suggested edge effects in the peripheral area.[20] Other studies have shown that increased nest predation can be greater on smaller patches and with increased proximity to patch edges.[1,13] Persistence may have increased because of successful dispersal and higher reproductive success due to reduced edge effects such as nest predation and intraspecific competition.

James found direct patch size effects on the site persistence of Burrowing Owls but I found only indirect patch size effects.[11,20] The number of breeding pairs did increase over time with patch size but small patches in the core.[20] Patch size did indirectly affect owl site persistence by determining the number of owl pairs over time. Patch size may be most important when the landscape is heavily fragmented and there are no large patches, as in James' study.[11] Larger patch sizes can increase the persistence of grassland species by reducing the probability of predation of individual birds and increasing pairing success.

Isolation also appeared to be important to Burrowing Owl persistence. Persistent owl sites appeared to have greater patch isolation in the core range.[20] Lower patch isolation appeared to enhance Burrowing Owl year to year dispersal between patches in the core and decrease the probability of repeated use of isolated patches perhaps due to reduced dispersal risks. This pattern was also evident in data on the extirpation and occupancy of core owl sites.[20] In contrast, lower isolation and more numerous nearby owl sites appeared to increase the probability that the peripheral owl sites would be occupied the following year.[20] Habitat modification at distant sites could decrease the persistence of existing Burrowing Owl sites by increasing the distance between sites and thus decreasing the probability of successful dispersal between owl sites.[21]

Population Turnover. Turnover means a change in the composition of biological communities in a defined area due to either the local extinction or immigration of a species or both.[20] MacArthur and Wilson's classic theory of island biogeography described extirpation and immigration as processes in a dynamic equilibrium.[15] To my knowledge, my study is the first attempt to examine population turnover in a fragmented prairie landscape. [20] Some possible important factors in the annual turnover of species include vegetation structure, site fidelity, surrounding land use, habitat connectedness and size and isolation of habitat fragments.[20]

Persistent and occupied Burrowing Owl sites had higher levels of isolation in the core. In the core range, the negative impact of the isolation of patches may have been low for Burrowing Owls as compared to other organisms in different landscapes. When the isolation effects were relatively large, they influenced the spatial distribution of core and peripheral owl sites and the persistence of peripheral owl sites.[20] Lower patch isolation appeared to enhance Burrowing Owl year-to-year dispersal between patches because of small dispersal risks in the core.

The amount of patch edge and several measures of habitat continuity were important to the difference between extirpated and persistent owl sites in the peripheral range. Edge effects may be important to the extirpation of owls from peripheral sites because of the negative correlation between peripheral owl site persistence and the amount of patch edge.[20] Increased edge effects can contribute to lower reproductive success of birds. Burrowing Owls are known to move to different pastures, especially if there is nest failure due to predation.[2] Habitat continuity was also important to the discrimination of extirpated and persistent owl sites in the peripheral range.[20] Due to larger subpopulations, the local extinction of birds from habitat patches is less probable with increasing area and habitat continuity.[20]

The colonization of core Burrowing Owl sites appeared to be enhanced by increased habitat continuity.[20] Colonization of core owl sites occurred on small fragments with minimal isolation and high surrounding continuity of habitat possibly because of reduced dispersal risks and sufficient resources. Isolation measures contributed significantly to the difference between colonized and uncolonized owl sites in the core and peripheral ranges.

As discussed earlier, occupancy of core owl sites was enhanced by increased isolation. Owls appeared less likely to move if there was no nearby patch or owl site, as has been observed for small mammals.[21] Greater dispersal risks, such as predation, likely determine the probability of dispersal between habitat patches. Patch dimensions and habitat continuity were important to the differentiation between occupied and unoccupied Burrowing Owl sites.[20] Occupancy of habitat patches by birds, mammals and arthropods is often positively correlated with patch area and habitat continuity.[20] In the peripheral range, the amount of patch edge may be important to the occupancy as well as the extirpation of owl sites.

From 1987 to 1993, extirpation of examined OBO sites increased from 16 percent to 54 percent and occupancy of examined OBO sites decreased from 79 percent to 31 percent.[20] These results support previous work documenting the decline of the Burrowing Owl population in Saskatchewan.[8, 12, 21] It is arguable that the patterns of habitat fragmentation contribute significantly to the decline of Burrowing Owl in Saskatchewan based on the correlations with Burrowing Owl spatial distribution, persistence and population turnover.

Conservation Implications

Burrowing Owls have the capacity for rapid population recovery because of their high reproductive potential and their broad prey spectrum.[4] It is recommended that management focus on the core portion of the Burrowing Owl range in Saskatchewan because the core contains the majority of remaining owls and the population decline there appears to be less severe.[20] Stabilizing the core will be critical for the long-term conservation of the Burrowing Owl in Saskatchewan. The core could then serve as a "source" where reproductive output is greater than mortality. The results of previous work suggest that maximizing the continuity of habitat and increasing the number of accessible patches with optimal dimensions would be a good strategy.

If the core Burrowing Owl population is stabilized, the focus could then shift to persistent peripheral owl sites. Occupancy could be enhanced in several ways. Removing marginal farmland from production could enlarge habitat patches and reduce isolation between nearby owl sites. In addition quality of habitat patches can be improved by a mix of short and taller vegetation and more burrows and patches within Burrowing Owl home ranges. These actions would also likely benefit other prairie wildlife species.

The conservation of the Burrowing Owl has a high level of support in Saskatchewan and a large number of habitat patches are already protected under Operation Burrowing Owl.[21] Therefore, the Burrowing Owl could be used as an "focal species" for prairie conservation. OBO could also serve as a model for new land stewardship programs. OBO in Alberta evolved into Operation Grassland Community to include other threatened grassland species in the program and to develop a more ecosystem-based approach to conservation (Dave Scobie, pers. comm.). In addition, more habitat patches in private and public ownership could be protected. For example, the majority of known Burrowing Owl sites are on private land. The provincial and federal governments hold title to most of the remaining large blocks of prairie in Saskatchewan. However, the distribution of Burrowing Owls on these lands is poorly known.[21] To increase the continuity of grassland habitat for Burrowing Owls and other species, additional private and publicly owned prairie habitat needs to be identified and protected through close coordination and cooperation between conservation agencies and private landowners and Crown land leasees. Carrying out the set of recommendations for the redesign of Canadian farm support programs, tax assesssments and Crown land policies by Thornton et al. would likely make it more economically advantageous for farmers to remove marginal land from cultivation and protect and rehabilitate wildlife habitat on their land.[18]

In conclusion, it appears that patterns of habitat fragmentation do affect grassland wildlife. The Burrowing Owl is a good example because the abundance, persistence and distribution of Burrowing Owl sites were correlated with the patterns of habitat fragmentation.[20] The conservation of the Burrowing Owl and the prairie ecosystem are linked. We can reduce the impacts of habitat fragmentation on Burrowing Owls and other grassland species and reduce costs of their recovery by protecting existing and creating additional grassland habitat.

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ORCHIDS OF THE PRAIRIE PROVINCES

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“Orchid.” The word has an exotic ring to it. There is a mystique about these strange and beautiful flowers that conjures images of steamy jungles, tropical islands and other faraway places. We see them mostly in conservatories, on corsages, or potted and decorating someone’s solarium. In conversations I have had with people, it comes as a surprise that there are orchids growing wild across the prairie provinces. Yet *Budd’s Flora*[1] lists 34 species of orchids, and 21 orchid species are mentioned — most of them with pictures — in *Wildflowers Across the Prairies.*[2]

It is exciting to think of so many kinds of orchids growing in our own region; even more exciting to realize that they are part of such a huge, diverse and fascinating family.

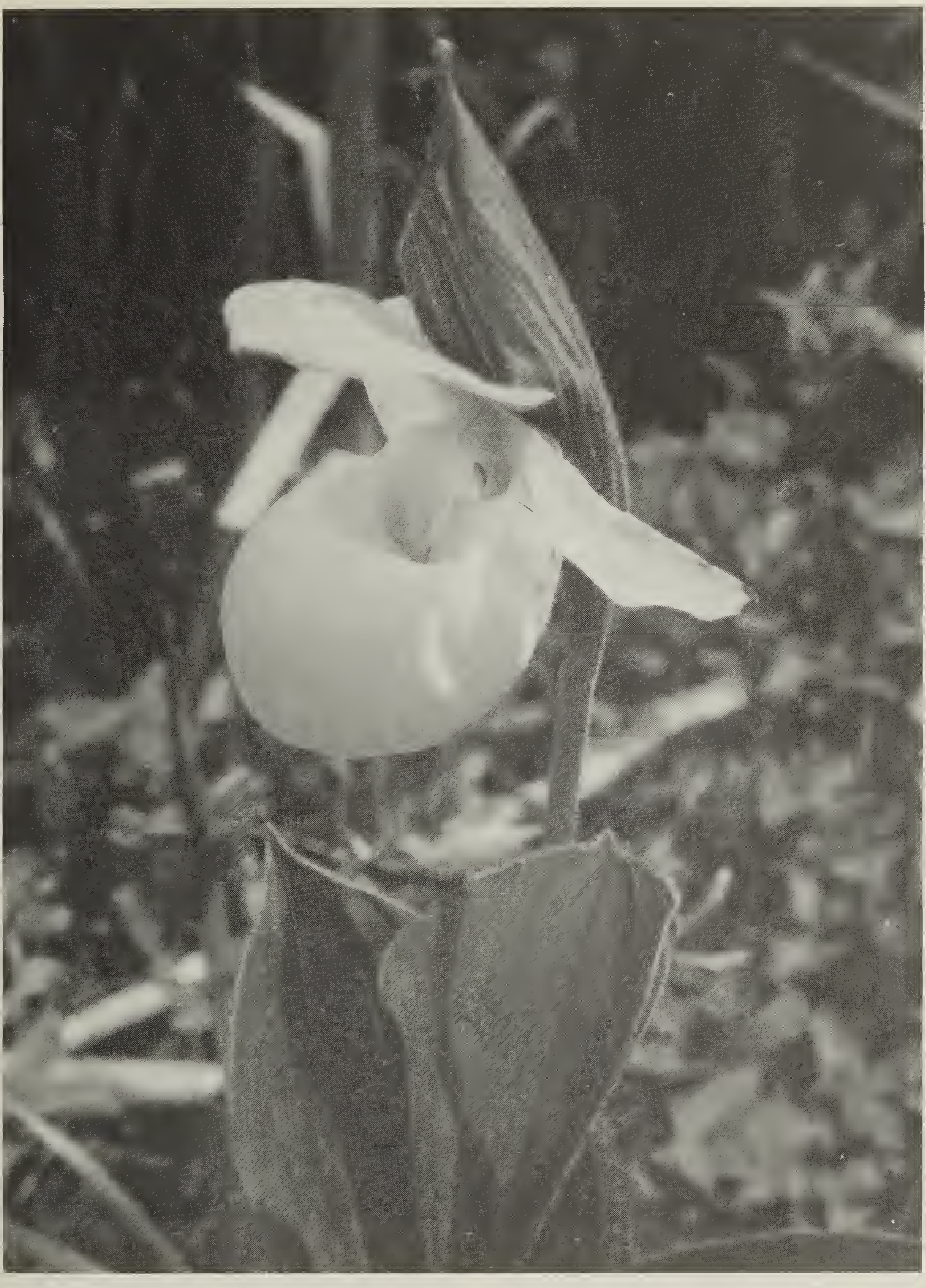
Orchids are found in almost every area, latitude, and elevation of the earth. The range of some is as broad as an entire continent, while that of others is limited to a single valley or mountain. The blossoms of some species are so small that one of them would fit into the zero at the bottom of our ten cent piece. Other orchid plants are huge. There are species that grow in Southeast Asia and Polynesia whose stems are

Yellow Lady’s-slipper *Roy John*

Pink Lady's-slipper *Roy John*

several meters high and whose entire weight is in the neighbourhood of a ton. The *epiphytic* orchids grow on tree trunks and branches, getting their nourishment from the air and from rain water and using the tree as an anchoring support. Many are *terrestrial*, growing from the ground as do most flowers with which we are familiar. Still others are *aquatic* and have their feet in water. There are some members of this family of plants that even grow underground. Two Australian species spend their lives almost completely below the surface of the soil, their flowers appearing above ground only enough to allow pollination by small flies, termites or beetles.

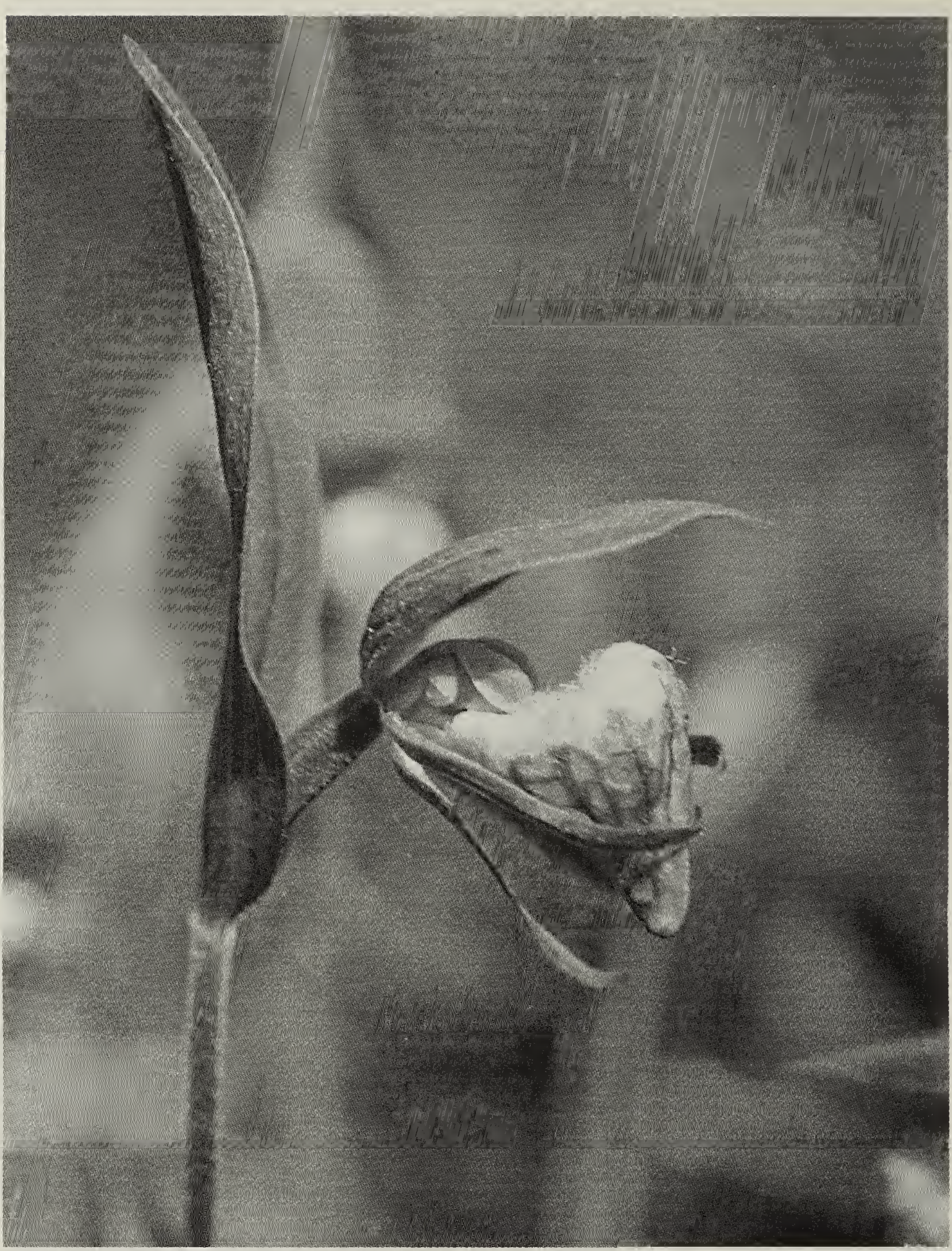
Orchids have intriguing ways of attracting insects and of getting them to work for them.



White phase of the Showy Lady *R.A. Mitchell*

Some of the most beautiful flowers in the world are orchids. But there are also members of this family that are ugly — even grotesque. Many have alluring fragrance to order to attract pollinators, while others smell like rotting carrion for the same purpose. Many of them have symbiotic relationships with fungi.

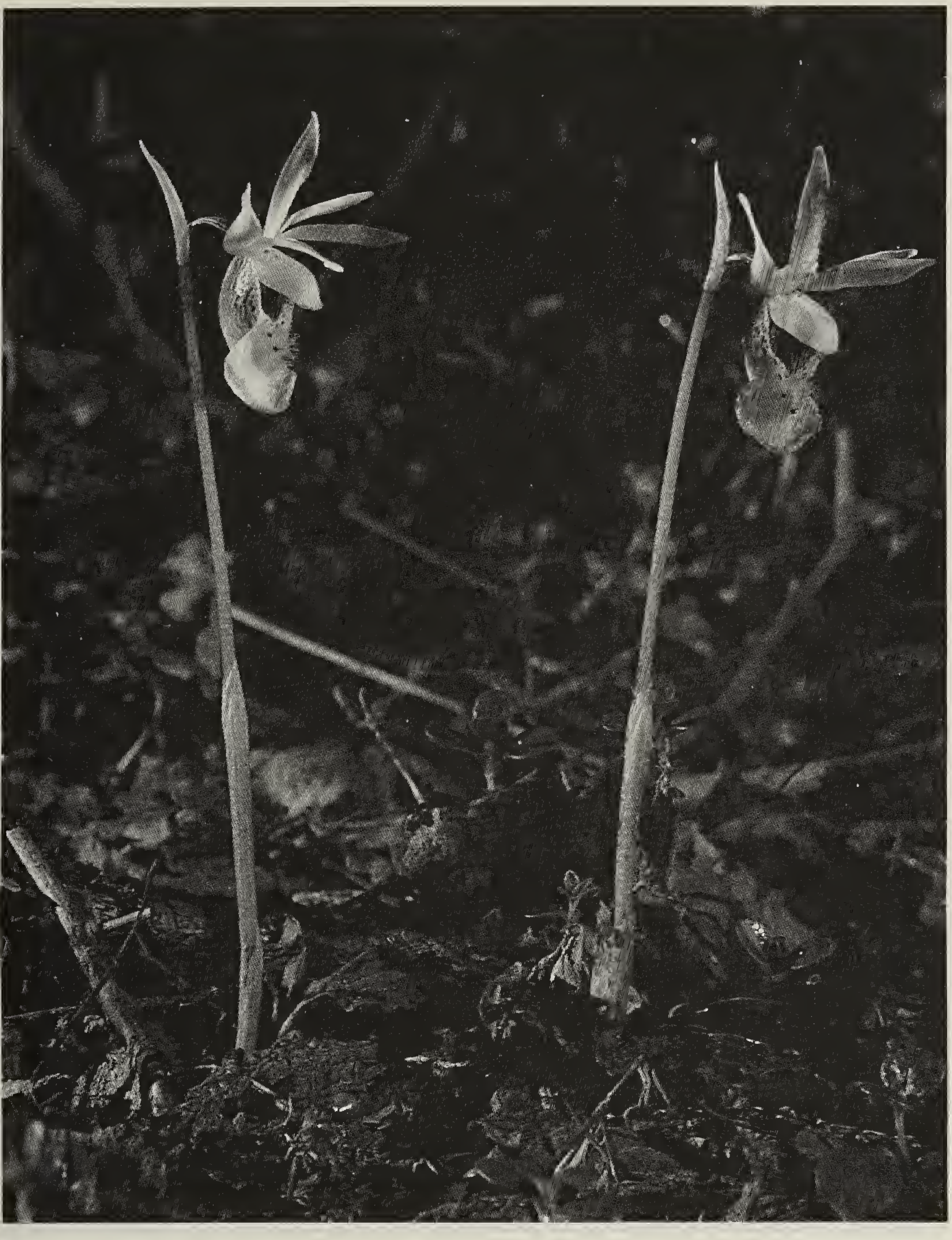
The diversity and fascinating character of orchid flora is evident amongst the species that call our prairie provinces home. Perhaps the most familiar of orchids is the Yellow Lady's-slipper (*Cypripedium calceolus*) which is found across Canada and as far north as the Yukon Territory. I remember it, with warm



Ram's Head Lady's-slipper *Roy John*

emotion, from childhood days in the woods near Porcupine Plain, Saskatchewan. There are two varieties on the prairies: the Large Yellow Lady's-slipper and the Small Yellow Lady's-slipper.[3] This species grows mostly in the boreal forest, but is sometimes found along roadways and railroad tracks, as well as in aspen groves and wetland edges, in more southern ecoregions. Like many orchid species, however, it is relatively rare. To find it is a privilege which should not be abused. Take inspiration from it, perhaps a photograph or two — carefully — and let it be.

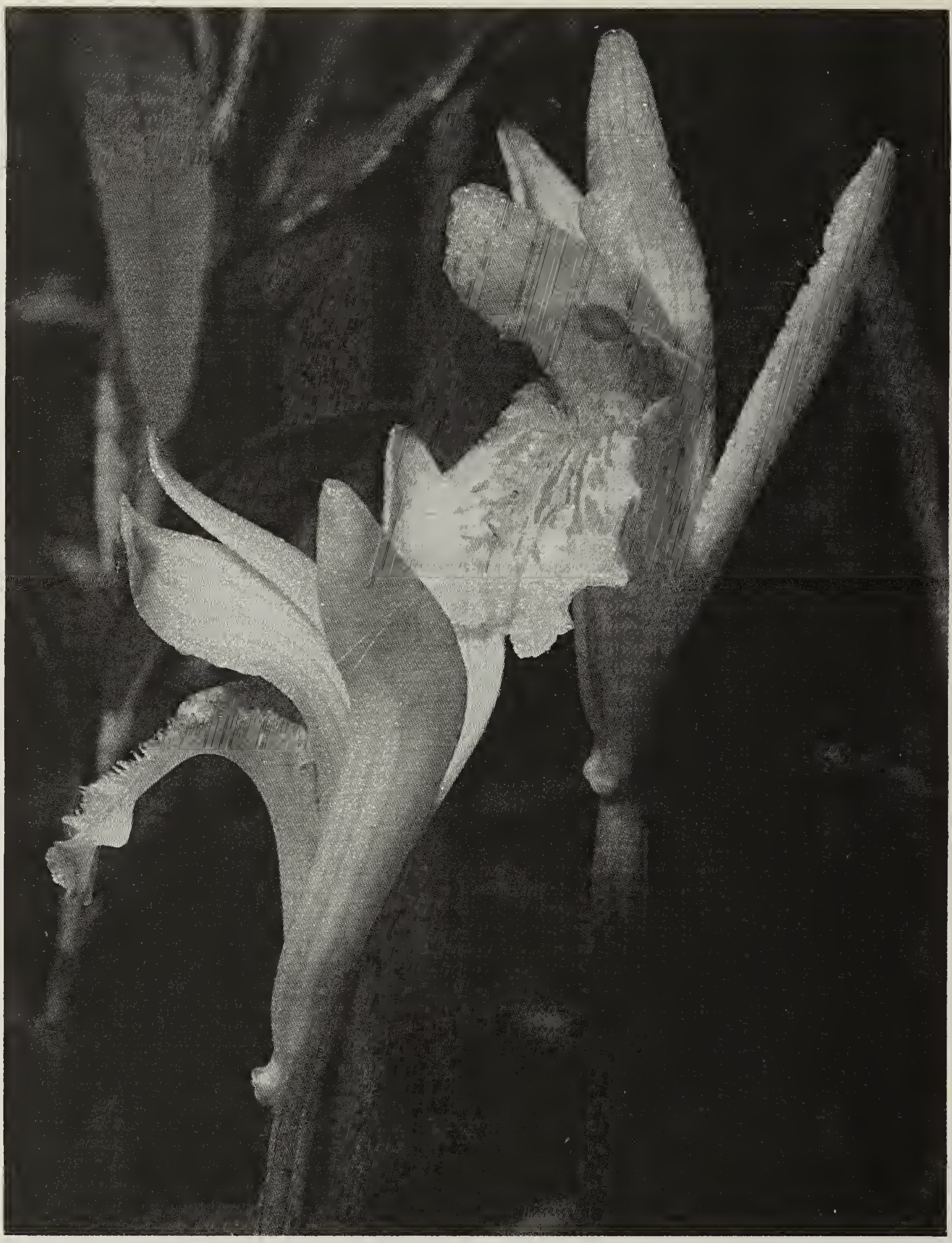
The Stemless Lady's-slipper (*Cypripedium acule*) also called Pink



Calypso bulbosa Dennis Rupert

Lady's-slipper or Moccasin Flower, is another species whose range is broad, extending from the Atlantic Provinces, through the boreal forest to Northern Manitoba, Saskatchewan and the Northwest Territories. Prince Edward Island claims it as its floral emblem, but it is cherished by many other Canadian naturalists. I can still feel the excitement that flooded over me when I first discovered it in a provincial park north of Lake Superior where we camped overnight in the early 1970s; and I prize the pictures I took of them at that time, one of which reminds me, for some reason, of a scolded dog with its tail between its legs. It prefers moist woods and wetland areas of the boreal forest, but like the Yellow Lady's-slipper, is rare.

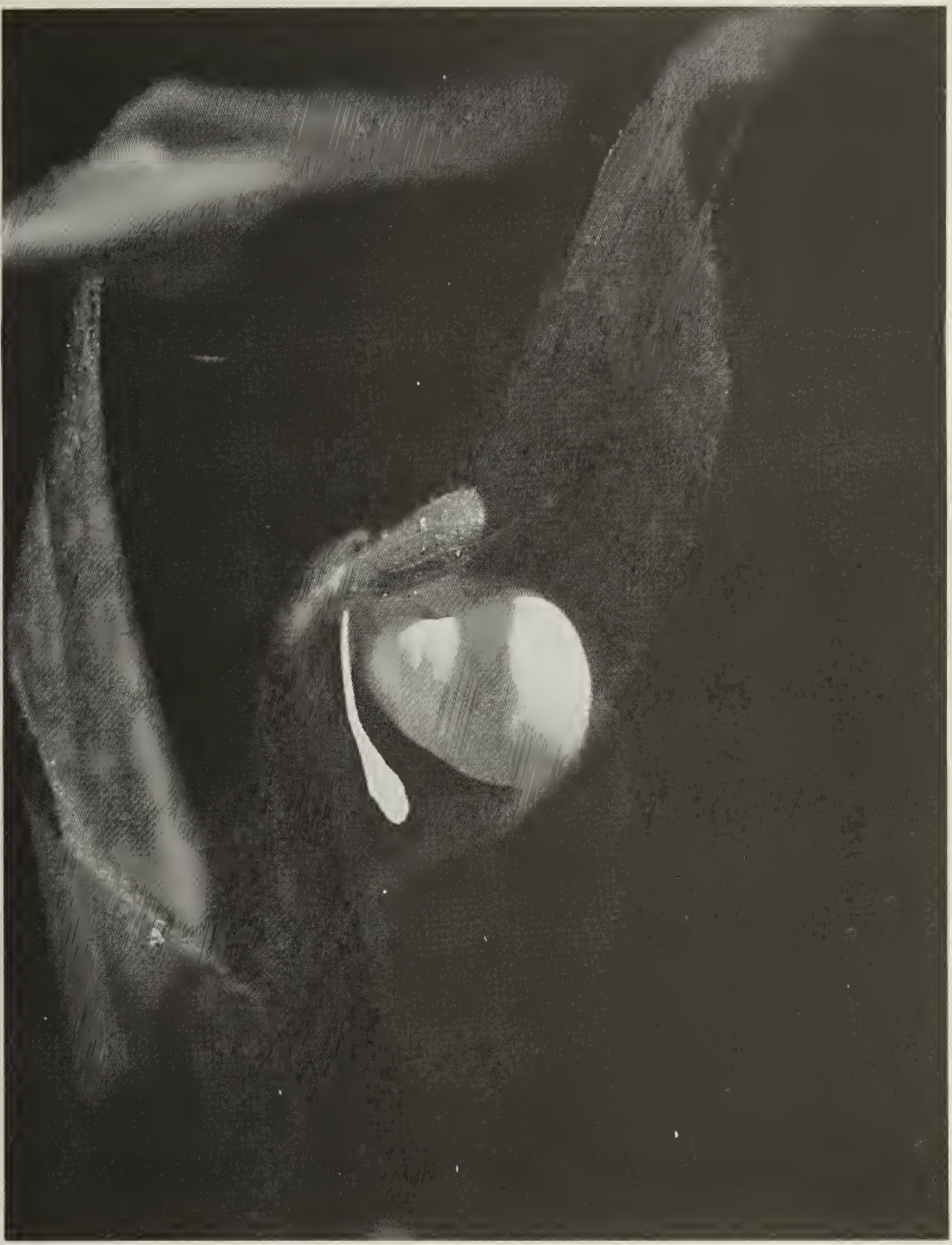
The most showy of our lady's-



Arethusa bulbosa *Dennis Rupert*

slippers is, not surprisingly, called the Showy Lady's-slipper (*Cypripedium reginae*). It is truly elegant. Pure white sepals and petals act as a foil for the magnificent rose-purple pouch. A clump I photographed on the Bruce Peninsula in Ontario was almost a meter in height and the blossoms were at least four centimetres in length and breadth. This is another species that likes wetland areas; it is rare, if not absent, in Saskatchewan but has been more commonly found in the southern part of Manitoba and as far north as Mafeking.[4]

The lady's-slipper which has been the most adventurous in northern climes is Franklin's Lady's-slipper (*Cypripedium passerinum*), also called the Sparrow's Egg Lady's-



Franklin's Lady's-slipper *Roy John*

slipper. Its range extends over most of Alaska and the Yukon territory, but has dipped down as far as the southern mountain region of Alberta. In Saskatchewan and Manitoba it is found mostly in the boreal forest, although the Cypress Hills claim locally abundant populations. In general — like the Yellow, Pink and Showy Lady's-slippers — it is rare.

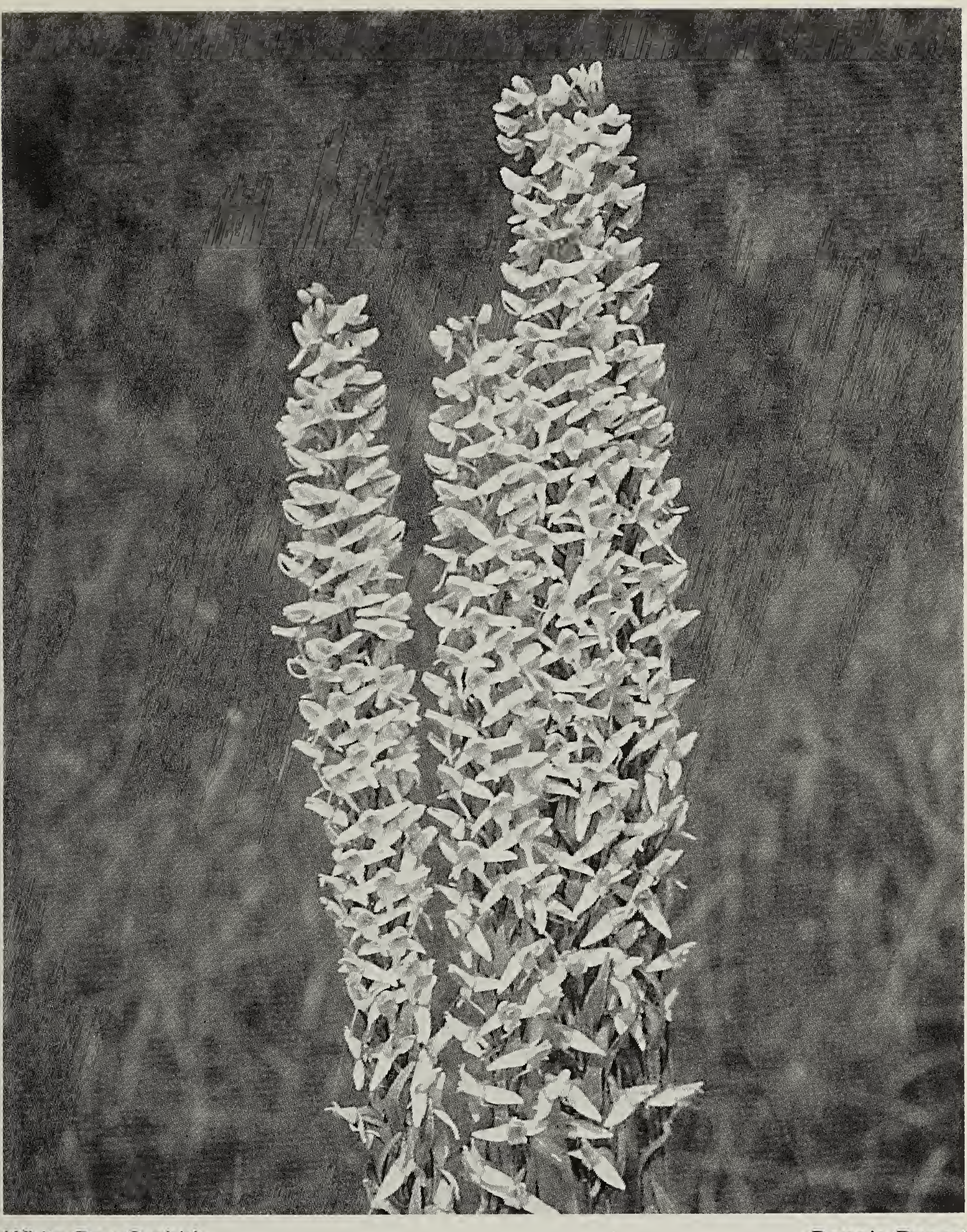
Three other *Cypripedium* species are even more rare in the prairie provinces: the small red and white Ram's-head Lady's slipper (*Cypripedium arietinum)*; the alpine Mountain Lady's-slipper (*Cypripedium monatanum*), the white lip of which is enhanced by a backdrop of striking brownish-purple petals and sepals[5]; and the sun-loving Small White Lady's-slipper (*Cypripedium candidum)*, which is now officially listed

Grass Pink *Roy John*

in Canada as an endangered species.

The scientific generic name for the lady's slippers, *Cypripedium*, is derived from two greek words meaning Aphrodite's little shoe, hence the name lady's slipper. Aphrodite, or Venus, was the Greek goddess of love and beauty who the famous ancient Greek author, Homer, called Cyprian.

In the ways of love, lady's slippers use their beauty to attract appropriate suitors, but make them work before they give them what they seek. The suitor, which is usually a species of bee, alights on the alluringly coloured and slippery lip and falls headlong into the depths of the slipper. Not liking to be trapped, the bee tries to escape the way it got in, but the inside walls of the pouch are as slippery as the place where it



White Bog Orchid *Dennis Rupert*

originally landed. An alternative escape route must be found. This the orchid obligingly provides in the form of a back door. To get through this back door, however, the insect must squeeze past the anther with its pollen sack which sticks to the visitor's back. After putting the bee through so much, the flower pays generously for services rendered. A feast of food hairs, each with a tasty serving of protein and sugar, is provided.[6]

Homer, in the *Odyssey*, relates how Odysseus, the hero of the epic poem, was detained for seven years on an island by a sea nymph called Kalypso. It was after this nymph that another exquisite orchid was named: *Calypso bulbosa*, the Fairy Slipper, familiar to those who visit the mountains, boreal forest, or Cypress Hills in early June. It is not large and showy, but is nevertheless among the world's most beautiful orchids.

Spotted Coralroot *Dennis Rupert*

John Muir, the renowned naturalist and conservationist, when he first saw it in a southern-Ontario swamp, after a very strenuous day of searching for it, called the experience one of two "supreme moments of my life." He wrote:

> "I found beautiful Calypso on the mossy bank of a stream ... It seemed the most spiritual of all flower people I had ever met. I sat down beside it and fairly cried for joy ... How long I sat beside Calypso I don't know. Hunger and weariness vanished, and only after the sun was low in the west I splashed on through the swamp, strong and exhilarated as if never more to feel any mortal care."[7]

Round-leaf Orchid *Roy John*

It was on Flower Pot Island off the tip of Ontario's Bruce Peninsula where I first saw *Calypso bulbosa*, an experience perhaps not as intense as the one John Muir described but one that nevertheless left a deep impression on my memory. Calypso truly does have irresistible powers to detain.

Surprisingly, however, when this gorgeous sweet perfumed creature detains its pollinator — not only a bee, but, appropriately, a queen bee — it gives absolutely nothing to its royal visitor.[8] The queen, mind you, is smart enough to be fooled no more than once; which means that the Fairy Slipper does not have a high rate of fertilization, only about 25%. It compensates for this by producing an enormous number of

Striped Coralroot *Dennis Rupert*

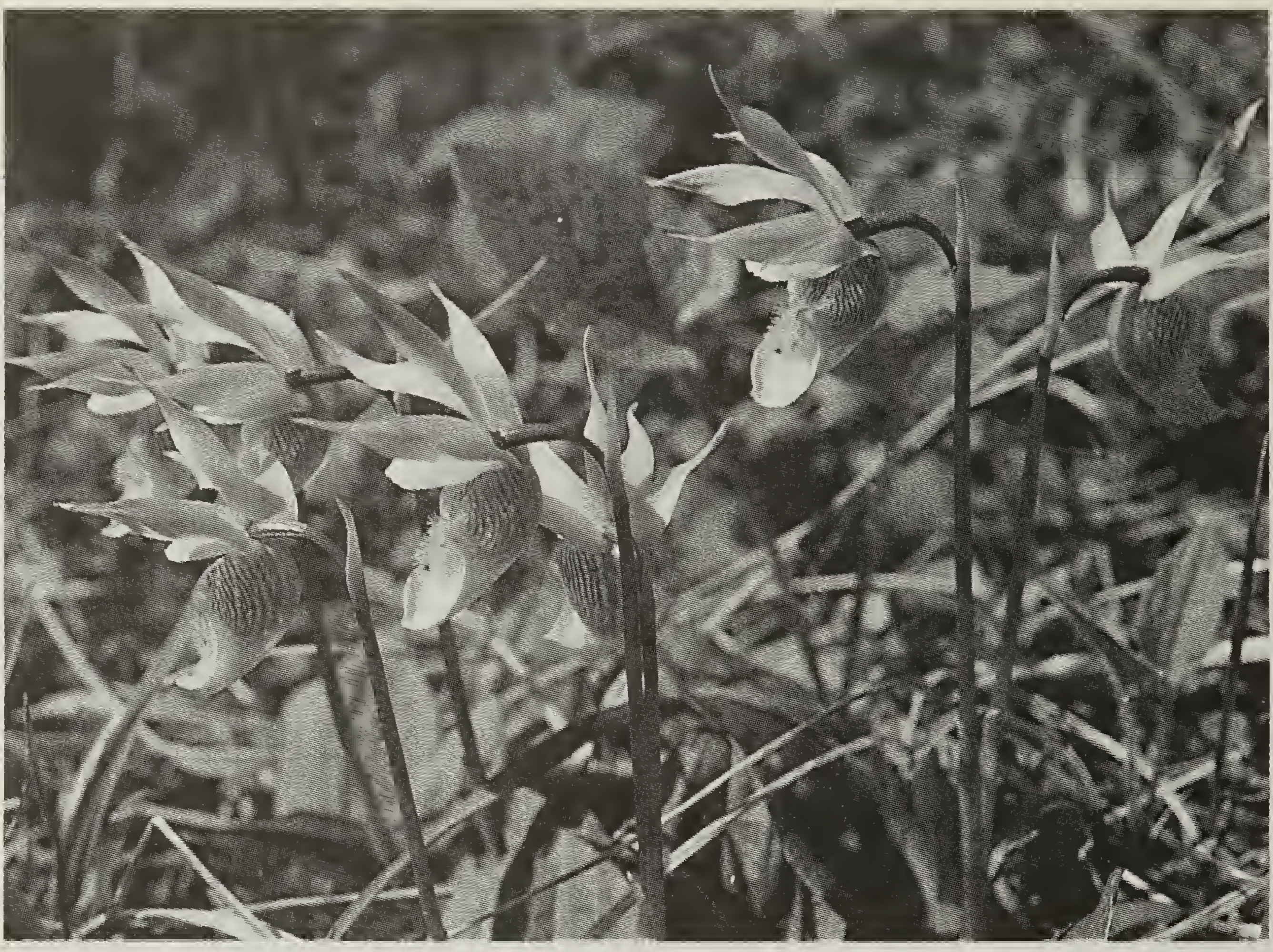
seeds — as much as 25,000 per flower. (I wonder who did the counting?)

Named after another nymph of Greek mythology is *Arethusa bulbosa*, Dragon's Mouth Orchid, or Swamp Pink, which I have never seen, but which is at the very top of my orchid wish-list. Far from being as fearsome as its name suggests, the Dragon's Mouth is quite small and has been described as one of the most beautiful orchids in Canada: a rosy pink, with an elaborate wavy-edged lip adorned with decorative purple blotches and many fine white hairs. It grows only in wet meadows and bogs, which is probably why it was named after the mythic nymph, Arethusa, who was transformed into a bubbling spring to

Rose Pogonia *Roy John*

escape an ardent river god's pursuit. Dragon's Mouth has been found in the Hudson Bay area of Saskatchewan and in a few places in Manitoba, but it is very rare. Mostly an eastern species, its range extends throughout the Atlantic provinces, Quebec and Ontario and reaches its western limit in our area.

Not to be confused with it is the Grass Pink (*Calopogon pulchellus*), another predominantly eastern wetland species similar in colour but very different in appearance. It ventures into the prairie provinces only as far as southeastern Manitoba. One of my personal favourites, it has taken my breath away on both occasions that I have seen it. One might call it the upside-down orchid, as the elaborate lip which is usually at the



Calypso Orchid, Banff *A. Clare Hume*

bottom is, in this case, at the top. There is a fascinating reason for this reversal of form. The upright lip is decorated with a brightly colored cluster of false stamens which attract the appropriate insect. When the insect lands on this deceptive beard, the lip, which has a kind of hinge, suddenly falls forward tossing the insect on its back against the reproductive column where it collects a glob or two of pollen and, at the same time, deposits whatever cargo it is carrying (The pollen of orchids is not in the form of fine dust, but of a sticky coagulated mass of pollen grains called a pollinium). Budd states that both *Calopogon* and *Arethusa* orchids are very rare.[1]

Less rare, thankfully, is the lovely little Round-leaf Orchid (*Orchis rotundifolia*[9]) which may be found in wet or moist woods and bogs throughout the boreal forest and in the Cypress Hills. The cluster of tiny flowers reminds one of a chorus of angels. Look closely and you will see that each one has a flowing white robe bedecked with red spots, has pure white wings, and wears an elegant poke bonnet trimmed with pink. My imagination even sees little mouths opening wide in song.

Bonnets are also worn, though less obviously, by the individual blossoms of the Hooded Lady's-tresses *(Spiranthes romanzoffiana).* The torch-shaped, snow-white flower clusters of this species stand out strikingly in the moist woods and wetlands where it feels at home. One of the more widespread orchids in North America, it grows across the continent, from Alaska to Newfoundland, and in the west as far south as Arizona and California.

The Slender Lady's-tresses, however, is my favourite of the two species. *Spiranthes gracilis* is more delicate in appearance. Minute white flowers spiral gracefully around a very slender, but tall, flower stalk, and a basal rosette of oval leaves acts as a foil for their beauty. Mostly an eastern species, the Slender

Lady's-tresses in the prairie provinces are confined to southeastern Manitoba and are rare.

One of the most fragrant of our orchid species is the White Bog Orchid (*Habenaria dilatata*). It is tall, up to 125 cm in height, with a graceful tapering spike of waxy white blossoms. Quite fitting is a name sometimes given it: "Bog Candle." It stands out conspicuously at some distance, and like some candles, the scent is delectably spicy.

Following the Nature Saskatchewan Spring Meet in the Cypress Hills this year, I found a spectacular clump of Spotted Coralroot (*Corallorhiza maculata)*, and spent a good half hour or so getting pictures. I had never seen such a large clump. It contained twenty flower stalks.

There are three coralroot species that grow in our region, none of them capable of photosynthesis. They are the saprophytic species which get their nutrients, in a symbiotic relationship with fungi, from organic material in the soil. The Spotted Coralroot and the Striped Coralroot (*Corallorhiza striata)* which I also saw in the Cypress Hills while at the Spring Meet, are reddish in overall appearance and have many flowers creeping up the stem. As their common names imply, one has red spots on a white lip while the other has red stripes. The Early Coralroot (*Corallorhiza trifida)* has fewer and less tightly clustered flowers with a mostly all-white lip and lacks the general reddish appearance of the other two coralroots.

There are other species of orchid that grow in our three prairie provinces — the twayblades, the adder's-mouths, the rattlesnake-plantains, to mention a few. I hope you will check them out in the flower books, and someday have the opportunity to see them. They are not as showy as the species I have mentioned, but each has its own fascination.

One thing to be aware of in looking at field guides and other books on orchids is that there is some confusion about the names. Taxonomists do not always agree on scientific names;[9,10,11] and there are often several common names used for a species. An example of both types of taxonomic confusion is *Habenaria obtusata* which some scientists call *Platanthera obtusata*, and which has at least four common names: Blunt-leaf Orchid, Small Northern Bog Orchid, One-leaf Rein Orchid and Blunt-leaved Fringed-Orchid.

It is not only the coralroots that depend on fungi for growth. All orchids require a relationship with fungi in order to germinate and begin their growth. Orchid seeds are extremely small and light. This enables them to travel well. They are ideally equipped to ride the air currents and may be carried thousands of kilometres. Not only that, they are able to remain in the dry and frigid upper atmosphere for as many as ten years and still maintain their fertility.[12] Orchid seeds are tough, prolific and are superb travellers, yet once they get settled in an appropriate habitat they are completely helpless on their own. They lack sufficient nutrients to nourish the embryo. Each seed has to wait until a certain species of fungus finds it. When the meeting between orchid seed and fungus mycelium takes place a strange love-hate relationship begins. Both orchid seed and fungus need each other, yet at the same time try to destroy each other. The fungus takes the offensive. Its mycelium attacks the orchid seed and starts feeding on the seed's very meager store of nutrients. The victim, however, soon becomes the aggressor. The seed turns into a parasite, digesting and living off of the fungus. If all goes well a balance of power is

Small White Lady's-slipper *Roy John*

reached and the two learn to live together, mutually benefiting from the relationship, through the period of the orchid's germination and early growth. A balance of power is not always the result, however. If the fungus is too vigorous it will devour the orchid embryo, and if the orchid is more robust, it will kill the fungus and thus destroy its own life-support system — unless another appropriate fungus finds it. Studies show that only a small number of fungi will enter into a symbiotic relationship with a particular species of orchid; and only those species closely related to the orchid will do the same with that particular group of fungi.[13]

When human impacts on soil such as fertilization and the spread of toxic chemicals destroy fungi, orchid species that depend on them also disappear. This is one reason why many orchids are rare. Other reasons for the dwindling of orchid populations are the destruction of their habitat — the decimation of forests and drainage of wetlands in particular — and the human compulsion to pick and to transplant.

Cultivated hybrid species thrive in commercial greenhouses, conservatories, and under lights in private homes. Their sheltered worlds are secure. Many wild orchid species, on the other hand, are in danger of extinction. A number of eastern Canadian species are listed by The Committee on the Status of Endangered Wildlife in Canada (COSEWIC), as either endangered, threatened or vulnerable. The situation in the prairie provinces is somewhat better. The only orchid native to our area listed by COSEWIC is the Small White Lady's Slipper, which is "endangered." Nevertheless, not many of our prairie orchid species are prolific. The uncommonness of most of them should alert us to the fact that we cannot simply take them for granted. What a terrible loss it would be if any one of them should disappear because of human greed or carelessness.

Orchids are among Earth's most precious jewels. Get to know them. Like John Muir, when he first saw the Fairy Slipper, celebrate their presence. Discover that they are not just exotic flowers of far-away jungles and south-sea islands; they are treasures of our own prairie province ecosystems, here to delight the hearts of any sensitive person who loves nature and, hopefully, to delight our grandchildren and their offspring for many generations to come.

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3. For a helpful description of the characteristics and the range of these two varieties see VERN HARMS. 1986. The Yellow Lady's Slipper Varieties in Saskatchewan and Western Canada. *Blue Jay* 44:87-95.

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5. HARMS, in the March 1985 *Blue Jay*, reported that this species had been seen in Saskatchewan's Cypress Hills west of Loch Leven.

6. For a more detailed description of the pollination of lady's-slippers see HILDA SIMON. 1975. The Private Lives of Orchids, Lippincott. p. 67.

7. Quoted in *Ontario Naturalist*, Vol. 16, No.2, April 1976, p. 5.

8. See Nature Canada, Spring 1994, 9f, for a full description of Calypso pollination by queen bees in Alberta's Kananaskis area.

9. Taxonomists differ as to the scientific name of this species. Budd's Flora and Wildflowers Across the Prairies both use *Orchis rotundifolia* as does JOHNSON, KERSHAW, MacKINNON and POJAR. 1995. Plants of The Boreal Forest and Aspen Parkland. Lone Pine, Edmonton. p. 92. W. PETRIE, however, in Guide to Orchids of North America, Hancock House, Vancouver and Washington, 13, uses the name *Amerorchis rotundifolia.*

10. PETRIE uses the scientific name *Spiranthes laciniata* for this species.

11. VANCE, JOWSEY and McLEAN along with BUDD use the name *Habenaria dilatata.* PETRIE, on the other hand, along with JOHNSON, KERSHAW, MacKINNIN and POJAR, uses *Platanthera dilatata* for this species.

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INSECTS AND OTHERS

INCREDIBLE DIVERSITY OF BEETLE WORLD INCLUDES 9,000 SPECIES IN CANADA

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This article originally appeared in the Saskatoon Sun

Beetles are chewing insects with two pairs of wings: the front pair forms a hard leathery shield over the other pair, which it uses to fly. A fairly typical beetle is the lady bug or ladybird beetle, that ferocious predator of aphids. An early 20th-century entomologist once said, "God must have loved beetles; He made so many of them." About 340,000 beetle species have been described by scientists. This is about 40 per cent of the 850,000 living insect species so far described, and 24 per cent of the 1.4 million described species, including all living things. Terry Erwin of the Smithsonian Institution estimates beetle species numbers world-wide at up to 12 million, most of them in the tropics. There are an estimated 9,000 beetle species in Canada; perhaps 4,000 of them live in Saskatchewan.

Part of our lack of awareness stems from the names we give them. Some beetles are variously referred to as fireflies, June bugs, lady bugs, and weevils. Glow worms, wireworms, flat-headed borers, and whitegrubs are all beetle larvae (immature states which are somewhat worm-like and often referred to as "grubs").

Beetles are in many cases difficult to see. Many of them are soil-dwelling and very small. We do recognize the Cabbage Flea-beetle only because it tends to be numerous in our gardens or in canola fields. Other beetles are hidden away. The Poplar Borer, for instance, is a common and very beautiful metallic yellow-green beetle. The sign of activity of its immature stage, a white larva, is highly visible in April and May. It is noticed in Trembling Aspen when you see sap dripping from a small hole containing a small pile of wood fibres.

Bark beetles, two species which are making the news because they spread Dutch Elm Disease, are about two mm long and live, for the most part, under the bark of trees. Attractive orange and black Carrion Beetles are common and big but tend to congregate around dead animals. In fact, they will lay eggs on mouse-size carcasses, bury them and guard them against other beetles. We think of "lady bugs" as a single kind of insect, but there are at least 64 species of them in Saskatchewan.

Why are there so many kinds? Like other insects, beetle success in numbers of species can be attributed in part to their small size, making specialization on a small resource profitable. Beetles are also prolific and mobile, and separate stages specialize in surviving adverse conditions (eggs, pupae), eating (larvae) and reproduction (adults). In addition, they are particularly well armoured, and their generalized body design is very adaptable in evolutionary terms to new modes of living.

HABITAT AND MANAGEMENT

PROTECTING ECOLOGICAL PROCESSES

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Introduction

Environmental protection is key to continued life on earth as we know it. The intent is to act as a counterbalance to pollution and pro-development forces in our technological societies.

Less commonly agreed upon are what needs protection. In the past, just as now, concerned persons have thought they knew what required protection: historically, this has first been rare and endangered species, then habitat, then ecosystems. Now, with the globalization of environmental concerns, environmental protection is concentrating on preserving the diversity of life, biodiversity.[19]

As the twentieth century hurtles to a close, the conventional wisdom says that protecting biodiversity protects everything else. Biodiversity is life's chief adaptive dimension. Hence, the diversity of life is its most important defence against severe and unpredictable disturbances. In the past, these disturbances have tended to be climatic, but now they are mostly human-caused, and even some of these may be climatic. The conclusion is that if we maintain biodiversity, nature will look after itself.

Yet, useful as it is, biodiversity is a slippery subject on which to rely as the chief protection goal. Biodiversity is a human idea about a state of being. Nature is not static, but dynamic. It changes continuously, whether influenced by human actions or not. Diversity is an important condition that enables life to adjust to changes, but the life system processes are as fundamental to a healthy nature as biodiversity itself. In nature, biodiversity helps to maintain ecological processes, and vice versa. The purpose of this article is to look at the need and means to maintain existing ecosystem processes in Canada's prairie provinces.

Ecological Processes and Ecosystem Dynamics

Before beginning a discussion on the protection of ecological processes, it is necessary to define the term "ecological processes." A useful definition is "ecological processes include all the physical processes and the plant and animal activities which influence the state of ecosystems and contribute to the maintenance of their integrity and genetic diversity, and thereby evolutionary potential" (Rickleffs and others[12]).

Rickleffs and others[12] recognise five major ecological processes that operate in all ecosystems: (1) biogeochemical (earth) cycles, especially the water cycle, (2) energy flow, (3) mineralization of organic matter in the soils and sediments, (4) storage and transport of minerals and biomass, and (5) regulation of the processes in (1) through (4), often by the activities of animals. These are functional or short-term ecosystem processes only. The long-term or evolutionary processes are system reactions to major outside disturbances, such as those imposed by severe climate change or by human developments. To understand these long-term processes it is important to review the ecosystem concept as it is viewed today.

The above definition uses the term "ecosystem." The meaning of this word has remained remarkably stable over the years, but ideas of how ecological processes work have changed dramatically in the last two decades. Odum's[8] definition of an ecosystem — "any area of nature that includes living organisms and nonliving substances interacting to produce an exchange of materials between the living and nonliving parts is an ecological system or ecosystem" — remains valid. While this definition relates to real places on the earth, note that it leaves the definition of the exact boundaries of an "area of nature" up to the observer, making this ecosystem concept partly subjective.

Regarding ecological processes, briefly, the idea of plant succession leading from a disturbed state to a "climax" self-perpetuating stage was adopted by early ecologists as an important ecosystem process.[1,17] Then Odum[9] initiated a switch to energy exchange as the chief ecosystem process. Yet Odum's "strategy of ecosystem development" was a succession of sorts as well, leading from energy instability following disturbance to equilibrium instead of to "climax" vegetation.

Later some ecologists became dissatisfied with the ecosystem concept. A few went so far as to suggest that ecosystems exist only in the minds of theorists but not in nature, and attempted to replace the ecosystem concept with the idea of a nature consisting of randomly determined patches with no real order or structure.[11] More recently, based on an idea from physics that self-organising systems are inherent in nature, the ecosystem concept again enjoys full theoretical status.

Schneider and Kay[16] describe the new ecosystem theory: "Ecosystems are viewed as non-equilibrium [subject to unpredictable intervals] structures and processes, open to material and energy flow ... species that survive in ecosystems are those that funnel energy into their own reproduction..." They state that "left to their own devices, living systems are self-organising, that is they look after themselves." Interestingly, this new definition of an ecosystem is what many have thought it to be all along. The road to the obvious often is more convoluted than we think.

The major problem in ecosystem management looming from this theory is that very little is known about disturbance thresholds in system processes, and research to discover them can be dangerous because it is possible only to guess at the thresholds without observing ecosystems actually collapsing in the face of disturbances. The only answer here may be direct observation of ecosystems that already have collapsed or are collapsing due to overuse by humans. Clearly the best defence against ecosystem collapse is treading on nature as lightly as possible, maintaining the full complement of ecosystem diversity. Again, this is nothing more than applying common sense.

Having looked at ecological processes and ecosystems, it is important to identify the forces that govern the primary ecological processes functioning in ecosystems. Clearly, the "most enduring features of the environment are relatively stable landforms." [10] Add climate and life forms and the result is an ecosystem with its entire array of functioning, dynamic, interacting processes. Change the landform or the climate or both, and processes will change permanently, causing the ecosystem to evolve. Thus if the change is too sudden and severe, the ecosystem cannot adjust and return to its old functions, evolving instead into something quite different and often unpredictable, not a good result from an environmental management viewpoint.

Health of Prairie Ecological Processes

Having identified the major ecological processes that function within ecosystems, some obvious questions relating to our Canadian prairie provinces come to mind. Have any of the major ecosystems in the prairie provinces already experienced collapse? The answer to this is "yes." The original grassland-parkland ecosystem dominated by the Plains Bison, is gone completely, along with the key predators, Wolves and Grizzly Bears. The new dynamics are totally different from the old in what remains of the native grassland and parkland, let alone the cultivated areas.

The impact to the humans present on the original grassland-parkland ecosystem was also enormous. The economic collapse was total as the original people became dependent upon European invaders for a time. It would be the sheerest arrogance of our technological society to assume that the same could not happen to it with continued over-exploitation of resources. The resources and the economic base are different, that is all.

The smaller wetland, valley, and hill ecosystems within the greater grassland area have fared somewhat better, but they are under continuous and accelerating assault by a variety of forces, attempts to stop them notwithstanding. The problem of draining wetlands for agricultural expansion is well known and note that over half of the wetlands are gone already and the assault is not ceasing.[5,6]

Streams continue to be dammed for flood control and water supply management. The smaller lakes are becoming polluted due to nutrients coming in from urban sewage and dissolved fertilisers. The stream valleys are relatively intact in many places, except where they are subjected to cottage developments and to flooding and erosion by reservoirs. The hilly areas are in better shape, but disturbances by agricultural and industrial interests occur in some places.

Which Ecosystems are in the Most Immediate Danger of Collapse?

The original grassland-parkland ecosystem already has collapsed, and remaining altered portions of it are under assault as discussed above. Likely, the wetlands are in the most immediate danger.[13] The situation with some smaller lakes is not far behind. Some may be surprised that the agricultural ecosystem which replaced most of the native grassland itself is in danger due to soil depletion and salinisation. Clearly, agricultural scientists and farmers are aware of this situation, but awareness of what happens and preventing it from happening do not always go together.

In the northern boreal forest and tundra there is still time to prevent the disasters that have occurred farther south. Timber is being clearcut, yes, but forest harvesting companies are preparing environmental impact assessments of their plans, and these must receive an airing by the public before they are acceptable to governments.[2] Additionally, the International Standards Organisations (ISO) is demanding that wood products be obtained and manufactured in environmentally acceptable ways before major buyers will purchase them. Already the new management plans look much better than the old ones, as the emphasis in forest management switches from sustainable timber yield to sustainable forest ecosystems.[2]

In the forest-tundra transition zone, where there are few commercial tree stands, the greatest present dangers to the ecological processes are from mining activities, physical destruction of too many Barren-ground Caribou, and disruption of caribou migration patterns. These dangers, while present, are not imminent, and the potential for this ecosystem to avoid collapse as happened in the grassland is excellent, given continued vigilance by the environmental and local communities.

In the forest-tundra transition zone, migrant caribou-predator systems tend not to be in balance. Predators, being territorial, especially when breeding, cannot travel freely with migrating prey, so for a large part of each year they are left with a drastic reduction in available prey, severely limiting their own numbers.[7] This means that prey populations are not regulated by predators, and increase until regulated eventually by food supply or disease. In our forest-tundra ecosystem, such a relationship has created the happy situation of providing an excess of Barren-ground Caribou during most years so that many are available for harvesting by indigenous humans. Disrupting the caribou migration process leads to a completely rearranged ecosystem with new operating processes followed by collapse of an important part of the regional economy.

What Process Disruptions Would Trigger Entire Ecosystem Collapses?

Examples abound of humans causing severe ecosystem process disruptions. The nature and extent of the disastrous results vary with the ecosystem. The Serengeti-Mara grassland-woodland ecosystem in eastern Africa, for example, has many species of migrant and sedentary antelopes, and predators. Removing one species would cause problems, but adjustments likely would occur, the system adapting to the changes because of the existing high level of biodiversity. In simpler ecosystems, such as our grassland-parkland region and the forest-tundra transition zone, removal of the keystone herbivore can cause a cascade of disasters among other species dependent on these herbivores. With the grasslands, this happened just over one hundred years ago. In the north, such an ecological disaster can be prevented. The Cree people, who are among the First Nations of that part of Canada, know that humans and nature are interconnected in a circle of life and that maintaining the harmony is needed for continued productive life.[4] The rest of us could learn from them.

Stopping or changing the timing of water flows in streams and polluting them can cause process collapse. Rearranging landforms, as happens when strip mines are not reclaimed, can have such an effect too, if a large area is covered or a local ecosystem is removed. The examples are legion. In fact, removal from or major disruption of the functioning of any one or more of the processes discussed here can trigger chaotic collapse of an ecosystem, with totally unpredictable results. Serious disturbance to any one ecosystem process would seriously affect more than one process at the same time. Such a situation not only would speed up any collapse, but would increase its severity.

What Process Collapses Would Be Most Dangerous to the Human Inhabitants?

Which are the most dangerous ecosystem disturbances to humans is dependent on the economic system. The collapse of the economy on the North American plains was caused by destruction of the primary resource, the Bison. A similar ecological catastrophe is possible in caribou country. Urban societies would collapse if the agricultural ecosystems ceased producing massive quantities of food, industrial raw materials became unavailable, or the transportation system stopped working. Imagine the chaotic result if all these functions stopped together.

Although modern technological societies have assumed the role of regulators of animal and plant populations, control may be elusive. This potential already is shown by pests becoming resistant to pesticides, difficulties in controlling invader animal and plant species, and even overuse of parks by humans wishing to commune with what is left of nature.

The most dangerous ecological process collapse to humans and to natural areas would be a cumulative collapse; an instance in which two or more ecological processes undergo fundamental change at one time. Human adaptability is cultural, not genetic, which makes humanity an extremely versatile species, an adaptation denied other species because of their dependence on the much slower genetic adaptation. For example, changes in the food chain and regulation processes may not be catastrophic to humans, as they can occupy most of the levels on the food chain themselves. Energy flow disturbances, however, especially to artificial ecosystems such as agricultural lands, can be very damaging to human economies. Combine that with a collapse of normal soil processes, and a significant change in a fundamental earth cycle, especially climate, and the ecological changes that occur then may be enough to make large areas of land uninhabitable by humans.

Discussion and Conclusions

Our knowledge about ecosystems is imperfect, and we may never know it all.[14] A process is a human concept subject to theoretical change as well as being a real event in a real ecosystem. How may we integrate our knowledge of prairie ecological processes into environmental management strategies that will work? Ecological processes are real, functioning in real ecosystems filled with growing, moving, eating, living things. So how may we ensure their future, despite change caused by our human excesses? Based on the information and discussion presented here, the following recommendations arise logically:

- no matter what the development, whether agriculture, forest harvesting, mining, or even urban sprawl, ensure landform and water system integrity;

- as much as possible, retain lands and waters in a natural state and manage them with minimal interference;
- change agricultural practices so that natural soil processes are not further jeopardised;
- pay much closer attention to reducing the emission of greenhouse gases so as to avoid human caused climate change, potentially the most fundamental process change of all;
- manage keystone herbivore species so as not to alter migration and other movement patterns, thereby avoiding food chain collapses;
- retain the overall age and species patch mosaic, with the patches near enough to each other so as not to lose genetic continuity, ensuring continued biodiversity;
- ensure stakeholder input into all resource use and environmental management decisions;
- ensure that First Nations and other local people, people who live within the natural ecosystems, are not only consulted for management decisions but sit at the management tables themselves.

How may we go about protecting ecological processes? The answer is simple to think about, yet it is anything but simple to implement: leave nature alone. The more fundamental question we need to address is how we humans can continue to live within the ecosystems of which we are part and which we now dominate without causing such severe disturbance that the systems collapse.

Some ecologists recommend that a change from the old human-centred ethic toward a land ethic, will do the job by changing our mind-set in favour of ecosystem management.[13,14,18] I too believe that such a fundamental change in our human attitude is essential, but I also believe that it is not enough, nor is an appropriate ethical change guaranteed by any means.[3] Human actions are not necessarily guided by ethics. Continued action on our part is required, ethic or no ethic. Encouraging glimmerings of such action actually are occurring, witness the power of the International Standards Organisations and the switch to ecosystem based land and water management by many industries. Yet the root cause of this change is public demand. Continued vigilance and education are key in this regard. Without the support of local people who make a living off the land, the actions will not continue in the long run.

Acknowledgments

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Plurals:
a siege of herons, a spring of teal, a company of widgeon, a cast of hawks, a covert of coots, a flight of swallows, a plump of wildfowl, a badelyng of ducks, a congregation of plovers, a murmuration of starlings, an exultation of larks.

NOTES AND LETTERS

RICHARDSON'S GROUND SQUIRREL

On 12 July 1997, I was driving along my pasture fence when I noticed a strange shaped bird perched on a fence post some distance ahead. I stopped and using my binoculars I realized it was not a bird at all, but a Richardson's Ground Squirrel. I soon drove on and the gopher, as we commonly call them, remained on the post until I was within 20 feet of it, when it dropped off, head first and disappeared into tall grass.

I have often seen ground squirrels perched on rocks or mounds of earth in order to get a better view of the area, but this is the first time that I ever saw one on a post.

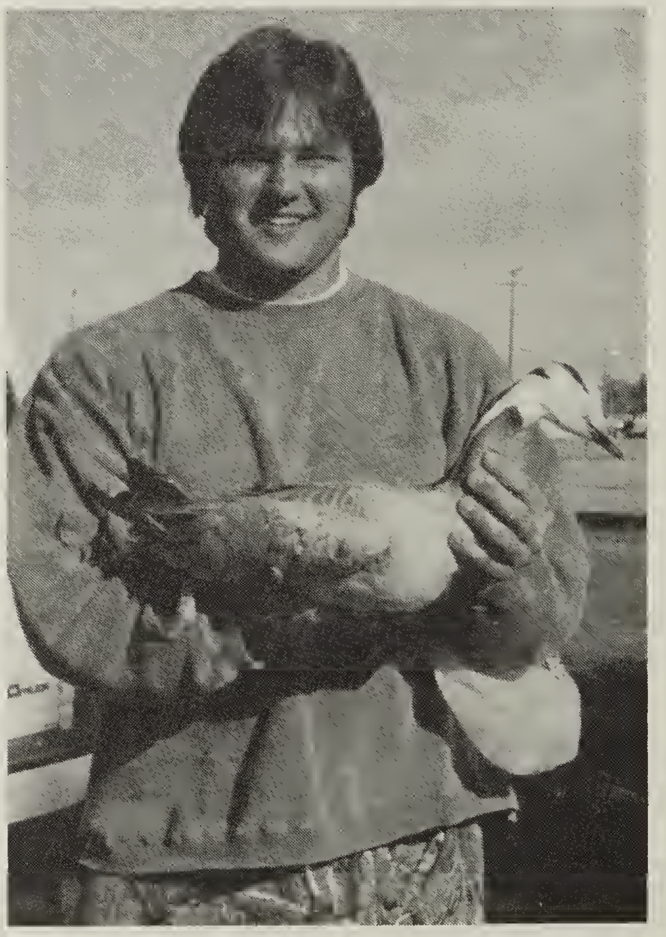
I measured the post and it was 4 feet tall with a 3 inch diameter, it had a slight lean of 3 inches to the four feet so would not be the full 90° but would be something like 86°. It was round and had been peeled so would not be so easy to climb.

- *Sig Jordheim*, P.O. Box 544. Kyle, SK S0L 1T0

BAR-HEADED GOOSE SHOT IN SASKATCHEWAN IN 1996

In June of 1997, I was contacted by Bill Chappell of Ducks Unlimited in North Battleford about a record of a Bar-headed Goose (*Anser indicus*) that was shot six miles east of Pierceland, Saskatchewan by Mr. John Chwelos of Dorintosh. His claim is that he shot the goose while with a goose-hunting party in October of 1996. This Bar-headed Goose (see photograph) was in a flock of Snow Geese (*Chen caerulescens*) that were decoyed into a stubble field in

Richardson's Ground Squirrel
Peter Sulzle



Bar-headed Goose *John Chwelos*

the morning prior to sunrise. As indicated in the photograph, the bird has all the field markings suggesting that it was correctly identified. It should be noted that this species does not breed in North America and because it is a recent introduction this record's status is in doubt. The National Geographic Society field guide states it is an Asiatic species, seen fairly commonly in zoos and private waterfowl collections. If anyone wishes more information on the incident, I would be willing to give you Mr. Chwelos's telephone number.

- *Jim Elliott*, c/o Nature Saskatchewan, Rm.206, 1860 Lorne Street, Regina, SK S4P 2L0

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FIELD HORSETAIL

Common or Field Horsetail (*Equisetum arvense*) is a peculiar plant that can fool you as to its identity. Though it belongs to a family allied to the fern, it somewhat resembles a fungus at first sight. This leads you to a dead end in identification. It is this nature of the plant that can confuse you.

This horsetail has two separate stems that grow and mature at different times, but are connected underground by a spreading root system. The plant is a perennial. There are 10 species in this genus. One is listed as being poisonous to livestock. Some of the members are called scouring rushes.

The first or fertile stems (Figure 1) to appear above the ground are straight and erect with nodes surrounded by sheaths composed of 8-12 teeth. The stem is striated and hollow between nodes, brownish/beige in colour. The stem terminates in a cone-like structure composed of 10-12 whorls with as many florets in each whorl. This fruiting body (strobilus) produces spores. The stems soon ripen and wither away. As the stem contains no green, or a very faint hint of green, it gives rise to the assumption that it is parasitic or a fungal plant.

The second or sterile stems (Figure 2) appear shortly after most of the fertile stems have ripened and died. The sterile stems are quite different in appearance and can emerge long distances from the fertile stems, adding to the confusion. These sterile stems have whorls of slender branches which give rise to its name of "horsetail." These vegetative stems produce and store food

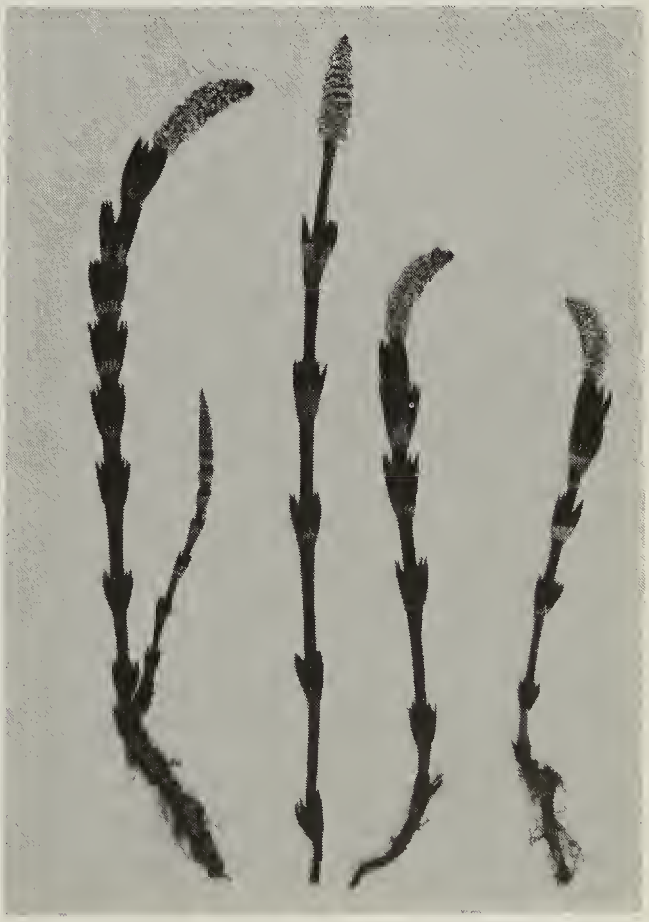

Figure 1. Fertile stems *Anthony Hruska*

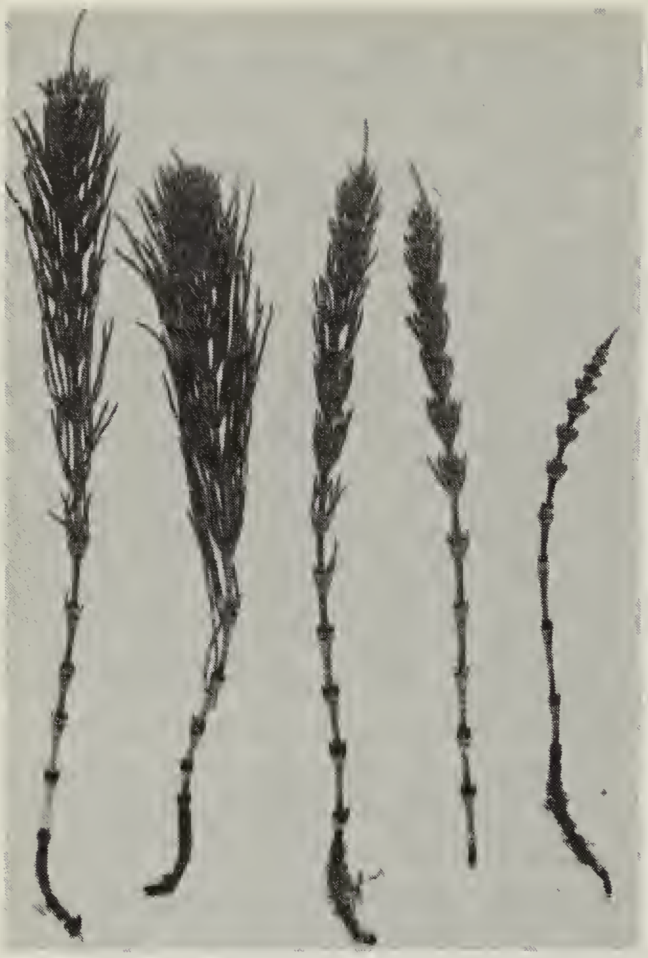

Figure 2. Sterile stems *Anthony Hruska*

for the plant system only. In moist locations they can grow up to more than 12 inches.

It is noted that this plant is common and widespread. In this area I have not seen, nor recognized it for many years. This year there is a profusion of growth along the roadsides. Evidently the growing conditions were ideal. A small growth of the fertile stems would not attract attention, especially if the stems were far apart and few between. It would be easy to miss them as they disappear quite rapidly. Also the plant may not produce sporangiophore stems every year. There are numerous massed patches along the roads where the fertile stems were not found, or observed, hence the conclusion that these stems were not produced at this time.

I wish to thank Dr. G.F. Ledingham, U of R, Biology Dept., for the identification of this plant. Also for his other observations which have been worked into our article.

- *Anthony J. Hruska*, Box 38, Gerald, SK
S0A 1B0

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Of the 46 species of crane known to science, 36 are extinct.

Dinosaur fossils dated back to 70 million years have been found near the Cypress Hills.

Wilson's Phalaropes can rotate at 60 turns a minute to draw prey up from the depths.

POETRY

ADAPTATION

Old World ravens — medieval days —
Jousting mid the fallen knights upon a battle plain
(Just an afternoon's bright skirmish)
Scavengers where all's decided
history of serf and lord and thane.

New World ravens — Old West frontier times —
Circling round vast bison herds in acrobatic flight
Ready for the coming slaughter
(And the settlement to follow)
Offal repast for the birds' delight.

Small-town ravens — modern high-tech world —
Perched on light poles, croaking greetings, wise in mankind's way
Then a fast commute to nuisance
Ground from alley, eager for the
Feast of goods on garbage pick-up day.

- *Victor Friesen*

Upland Sandpiper *George Tosh*

AUTHOR INDEX TO VOLUME 54 AND INDEX TO VOLUME 55, 1997

Compiled by Gail Bunt

Editor's note; The author index to Volume 54 was inadvertantly left out of last December's issue. it was not until mid-year that we noticed the error! Rather than confuse people further we decided to wait and include it with the 1997 index.

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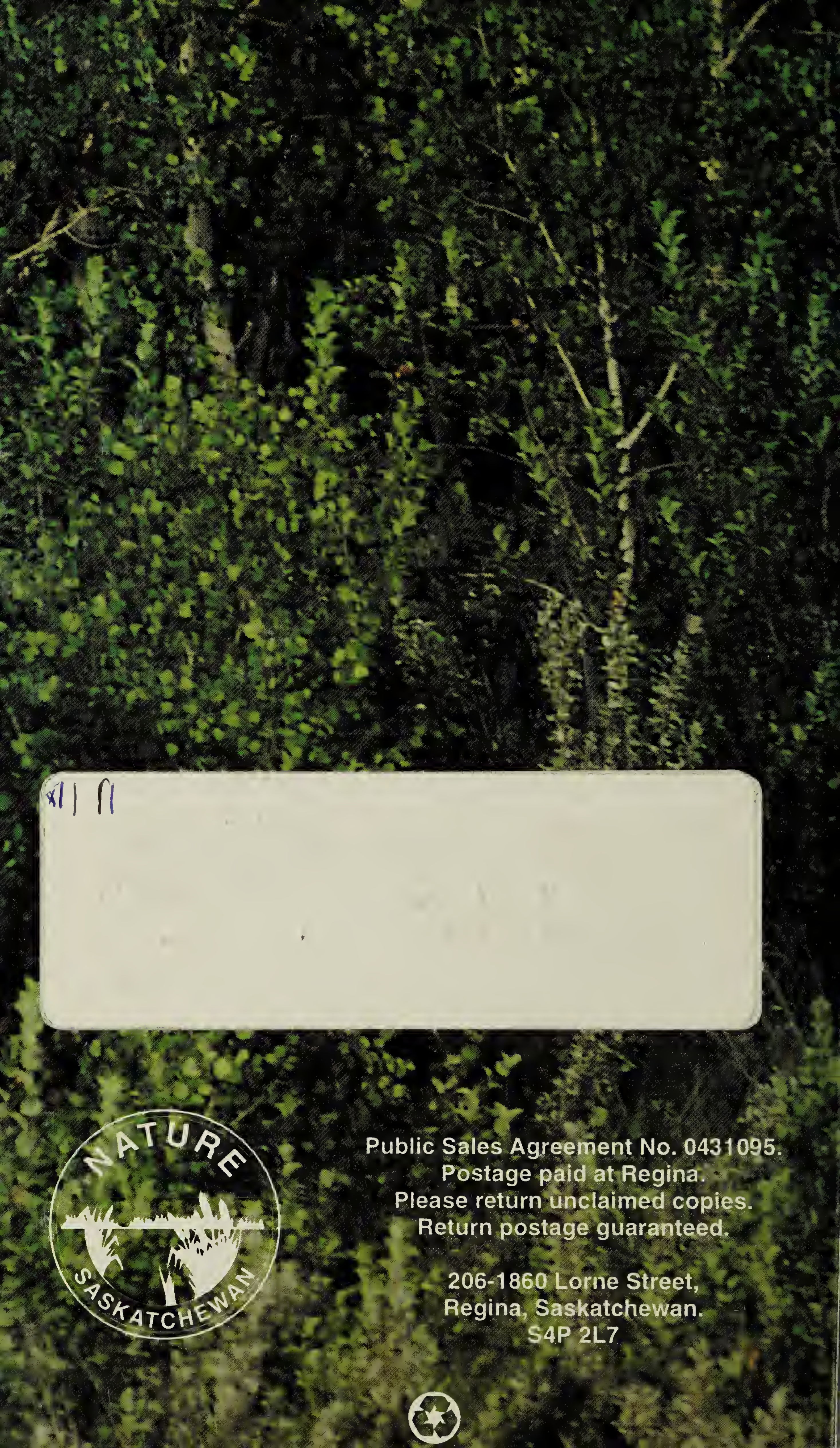

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